THE GEOGRAPHICAL JOURNAL

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Monday March 23 *at* 5 *p.m.*
UNDERDEVELOPED AGRICULTURAL AREAS OF GREAT BRITAIN. *By G. P. Wibberley.*

Monday March 30 *at* 8.15 *p.m.*
SWISS EVEREST EXPEDITION 1952. *By Dr. E. Wyss-Dunant (Dickson Asia Lecture). Admission by ticket* ONLY, *to be issued in order of receipt of application, which should be made to the Ticket Office.*

Monday April 20 *at* 8.15 *p.m.*
AMAZON ADVENTURE. *By Sebastian Snow.*

Monday May 4 *at* 5 *p.m.*
THE APPALACHIAN RELIEF. *By Professor P. de Béthune.*

Monday May 11 *at* 8.15 *p.m.*
THE EAST ANGLIAN FLOODS. *By Professor J. A. Steers.*

Monday May 18 *at* 5.30 *p.m.*
FILMS (*to be announced*).

Monday June 1 *at* 5 *p.m.*
THE ARIZONA AND MOHAVE DESERTS. *By Dr. W. G. V. Balchin.*

Monday June 8 *at* 8.15 *p.m.*
EVENING MEETING (*to be announced*).

Monday June 22 *at* 3 *p.m.*
ANNUAL GENERAL MEETING.

ANNUAL DINNER

The Annual Dinner of the Society will be held on the evening of Monday June 22, at the Hyde Park Hotel, at 7.30 for 7.45 p.m. Evening Dress with Decorations. Tickets; two pounds five shillings, including red and white wine. *Applications for tickets* for Fellows and guests should be made in writing and should be sent with remittance and names of guests to the Honorary Secretaries, to arrive in any event not later than June 8. But since attendance will be limited to 250, tickets will be allotted in order of receipt of application. Applications should therefore be sent in as soon as possible.

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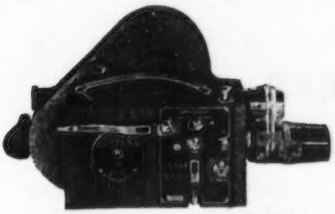

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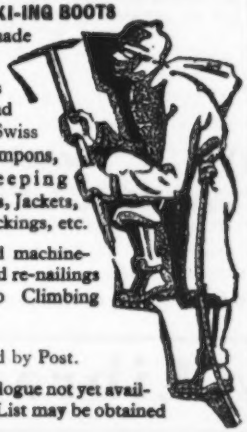

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The
GEOGRAPHICAL JOURNAL

Vol CXIX Part 1 *March 1953*

WAR-TIME EXPLORATION IN DUTCH NEW GUINEA

DONALD F. THOMSON

FOR MANY YEARS we have known at least two facts about the south-western area of Dutch New Guinea (the territory west of the Fly river); that in many places it is a vast morass, covered with the sago palms which provide the staple food of the natives, and that its people show in their art and material culture strong evidence of influence from Indonesia. It has long been something of a no man's land; a fever-ridden wilderness still peopled by head-hunters, a country to be shunned. Under the Dutch Government a settlement for administrative purposes was established at Merauke on the south coast near the Papuan border in the territory of the Marind, and a penal colony was located at Tanahmerah on the upper Digoel river.

The coastal fringe of Dutch New Guinea, below the great ranges of hills which rise steep and rugged to the Snow Mountains more than 16,000 feet high, is low-lying, and much of it is covered with dense jungle or sago swamps. This region is inhabited by people who are still head-hunters and very little of it has been explored, except perhaps years ago by venturesome Portuguese bird of paradise hunters. Rain falls almost incessantly in the steamy morass, the swamps are rife with malaria, and leeches and mosquitoes make life a burden for the white man.

A remarkable feature of the coastal zone on the south-west of Dutch New Guinea, especially of the southern coastline, is the close resemblance it bears both in its geographical character and in its flora and fauna, to parts of Cape York Peninsula, north Queensland, and the Northern Territory of Australia. It would be possible for an Australian who knew north-eastern Australia well, and who had a good knowledge of natural history, to be set down in many places in this territory, particularly in the country a few miles north of Okaba, where he would not be able to say with certainty whether he was in Australia or New Guinea. He would meet with wallabies of the same species that he knew in north-eastern Australia; parrots, cockatoos and other birds which would be familiar to him; and unless he saw a native, or chanced to see a hornbill or some other bird he did not know in Australia, he would have no conclusive evidence as to his whereabouts.

I shall describe two patrols of exploration which General Headquarters sent me to carry out in Dutch New Guinea for the First Australian Army

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Routes of patrols

and Merauke Force. The chief objective was to penetrate the vast swamplands of the upper Obaa–Wildeman rivers and to learn whether a connection by water existed, or could be forced, between the two river systems; to explore the Wildeman river and thence to extend the patrol downstream to the estuary of the Eilanden river.

The patrols, which were successful, covered more than 800 miles of jungle and swampland, encountered head-hunters who fled at our approach and watched us from the tops of high trees in the rain forest fringing the river. Sometimes the natives emerged from the dense riverside jungle and approached timidly in canoes, waving aloft the coveted plumes of birds of paradise. At other times they were to be seen, armed to the teeth, standing in their canoes at the fringe of the jungle; always, ominously, without their womenfolk.

In 1943, when the presence of strong Japanese forces in Indonesia as far south as Timor, the Kai Islands, Amboina, the Aru Islands and Netherlands New Guinea, threatened the line of communication to Australia through Torres Straits, Dutch New Guinea became of first-class importance to the Allied Forces. An Australian force had been landed on the south coast with headquarters at Merauke, and a small garrison of Australian troops had been established at Tanahmerah on the upper Digoel river. A little later an Australian outpost was added at Mappi on the north bank of the lower Digoel. The Japanese had been in occupation of the west and north-west of Dutch New Guinea for nearly two years, and they were reported to have ingratiated themselves with the natives of this territory and to be employing them for reconnaissance work.

Between Mappi Post at the junction of the Mappi and Digoel rivers, and the known points of Japanese occupation, lay a great unknown and unexplored swamp area, extending west and south-west for hundreds of square miles. Aerial photographic reconnaissance had shown that the Japanese were in strength to the northward, where they had been in almost undisputed occupation for a long time. This much was known. But to what extent they had infiltrated the country to the south and south-east, how far they had pushed patrols and outposts towards Mappi and the Digoel—in short, as to what lay in some two hundred miles of reputedly impassable swampland and morass—there was no information at all.

Japanese aerial reconnaissance had been active over a wide area. The enemy had bombed Merauke and had subjected Mappi Post, then a Dutch administrative station, to such a concentrated low-level bombing that the post was abandoned by the Dutch civil administrative officials, who sought refuge in the dense cover of the jungle on the south bank of the river at Jodom, a few miles upstream. Here I found them in a jungle hideout, on my first patrol from Okaba. Subsequently Mappi was occupied by a detachment of Australian troops.

Two attempts made by Dutch parties to traverse the swamps between the junction of the Mappi river with the Digoel and the Wildeman river, and to find a connection between the Okaba and Wildeman watersheds, had failed. One of these attempts was made by a party in a small craft, the other by a detachment of troops. Both groups reported having encountered heavy

barriers consisting of islands of floating weed and debris which they were unable to pass, and both had been forced to turn back. The Dutch authorities in Brisbane whom I consulted, told me that they regarded this territory in the south-west of Dutch New Guinea as some of the worst in the world. There were hundreds of square miles of swamps filled with water on which were floating islands of aquatic grass and vegetation, which formed the stronghold of head-hunters. They said that there was almost no dry land, but just a vast swamp in which the natives travelled in large dugout canoes and lived in houses built in trees, or raised on long piles above the water. It was infested by hordes of mosquitoes and leeches; malaria, yaws (*Framboesia*) and leprosy were rife. Furthermore, head-hunting was the spice of life to these people, who spoke no Malay or Pidgin, who had never been brought under control and whose country had not yet been explored. Such was the picture of this no man's land.

The first part of the task with which I was entrusted was to explore and reconnoitre the upper Obaa river and the swamps to the north, with the object of discovering a route through the swamps into the watershed of the Wildeman river, and thence into the Eilanden, and to determine the extent of Japanese infiltration in south-western Dutch New Guinea.

Our two patrols covered a total of about 800 miles. We travelled on foot, by native canoe and in any small watercraft that could be obtained. I was already tired after years of tropical service, and the severity of conditions in the jungle and swamps imposed a great strain on all of us. Almost the first Malay word which I learned was *loempoe* (mud) and the phrase *loempoe banjak* (plenty mud) recurred often. Rain fell almost incessantly, so that it was difficult to find a dry place to sleep, and leeches and mosquitoes were encountered in incredible numbers. To any carriers not born in the swamp country and unaccustomed to negotiating deep mud and morass, the journey would have been impossible. After a day or two in heavy military boots, always full of water, I knew that if I was to get through at all, much less set the pace for the men I was leading, who were younger than I, who were not tired from years of tropical service and who looked to me for a lead in jungle travel, I must disregard the rigid anti-hookworm and other regulations issued to troops by the Australian Command, and abandon my boots. Soon after leaving Okaba on the first patrol I discarded them and passed them to a native who carried them slung around his neck. From this time on I carried out most of the patrols in this area, including the journey overland from Okaba to the Digoel, barefoot. Freed from the handicap of heavy army boots and the weight of waterlogged puttees and gaiters, I had now a considerable advantage over the other white members of the patrol which helped to offset the weariness that I could not overcome. This mode of travel was possible for me after years with the aborigines in Arnhem Land on the Australian mainland. There I had travelled barefoot with nomadic hunting groups before the war, and again later, when leading native scouts on reconnaissance, so that I would not leave a shod footprint to indicate to the enemy that a white man was leading the patrol. In Arnhem Land the heat of the sun had often made the ground too hot to stand on, and the hard sharp stubble of newly burned grass and the outcrops of rock and buckshot gravel made

Swamplands of the Upper Obaa River.

conditions severe. In that territory, my feet and those of the natives with me often became badly cracked and fissured, but in Dutch New Guinea conditions were very different. There was no longer the burning hot and intensely hard ground to contend with. However in the wet and humid conditions of the swamps and jungles there was the risk of serious injury from the hard, razor-sharp stems of bamboo left where the natives had cut them obliquely close to the ground. The risk of infection with hookworm and amoebic dysentery was also greater. A picture of the severity of the conditions in this low-lying coastal area, and the effect of the oppressive climate on the average white man's morale can be gleaned from many passages in Wollaston's account of the British Ornithologists Union's Jubilee expedition to Dutch New Guinea [1]; particularly in the final paragraph of the preface, which reads, ". . . to my fellow-members of the expedition I would like to wish further voyages in more propitious climates."

This account still remains by far the best one of this country yet published; certainly in English. The more recent Archbold Expeditions,[2] which were well equipped and well organized, carried out important scientific work over a wide area but in a different part of this territory, concentrating principally on the high altitude country in the vicinity of the Snow Mountains.

We did not have the manpower or the equipment to supply a big expedition, and in any case this would have been undesirable and would have attracted the attention of enemy reconnaissance. Where possible we travelled by canoe and lived off the land to conserve our precious reserves of fuel and food. I had to leave much of this in a reserve depot at Jodom on the Digoel river, but endeavoured to carry some as far forward as possible.

I had seen the dispatch to Merauke Force from First Australian Army, concerning the assignment for which I had been lent. From this, it was abundantly clear that I was dependent on what resources the Force Commander would make available to me (and therefore upon his goodwill), and that I was placed under local control for all purposes. Before I had been long in Merauke I knew that I was "out on a limb." The Eilanden patrol would have been a difficult task at any time, but, hampered by regulations, I soon began to realize that I would have to carry the whole undertaking on my own shoulders. I knew that once I set out on the final reconnaissance I must not turn back, whatever the circumstances.

Looking back on this period I still remember as from a nightmare the weeks of tension and frustration, and the time wasted needlessly hanging about headquarters at Merauke, which could have been spent in a temperate climate. I remember the futile signals, the feeling of strain under which we prepared to undertake a task seemingly impossible with the equipment and organization at our disposal, while cut off from effective direct communication with those who could have understood; those who would have given us the freedom to prepare and select the best available equipment. This would have saved the vital nervous energy which was expended in the weeks of waiting, in sending signals and awaiting replies. My final dispatch to the Royal

[1] A. F. R. Wollaston, 'Pygmies and Papuans,' Smith Elder and Co., London, 1912.
[2] "Results of the Archbold Expeditions," *Bulletin* 41, *American Mus. Nat. Hist* 89 (1942) 197–288.

A hut festooned with human skulls and large wooden shields.

Australian Air Force before we set out on the final patrol was to request promotion of Sergeant Gordon Ritchie (my second-in-command) to Flight Sergeant, because I was worn out. I was suffering from chronic malaria, I slept very little and I knew that Ritchie might well have to bring the patrol back. When eventually we left Merauke, all three of us were very close to breaking point.

The first patrol: Okaba to Jodom

The first journey was in the nature of a reconnaissance, and was carried out with two other white men from First Australian Army stationed at Merauke, with a team of native carriers recruited at Okaba, on the south coast of Dutch New Guinea, west of Merauke. Although some reconnaissance had been carried out locally and an Australian Army outpost was already established at Okaba, little critical geographical information was available as to the nature of the country and its people, or the means and conditions of travel between Okaba and Mappi Post, my first objective. I determined therefore to make a quick preliminary reconnaissance on foot from Okaba to the Digoel. At Okaba I obtained native carriers who were familiar with the country, and unlike the natives on whom we had to depend later, these "*kaiya kaiya*" [1] were sophisticated and spoke some Malay. This patrol was carried out during late July and early August, which normally would have been the height of the dry season. But on account of the torrential rains which had fallen before the start of the patrol and which continued during the whole course of this journey, the country from Okaba northwards, which is low-lying and swampy, was heavily flooded. Travel was heavy and difficult and would have been impossible without the aid of big native dugout canoes at certain points.

The terrain from a point about 3 miles north of Okaba to Jawimoe is flat, forming a wide flood plain with no prominent landmarks, and is open grassland or clothed with savannah forest with only occasional patches of typical rain forest or "jungle." North-west from Jawimoe it is intersected with swamps and waterways. Along these watercourses typical rain forest or tropical jungle is well developed and this increases in area and in luxuriance near the Digoel river. The Digoel itself is fringed by dense and very heavy tropical jungle with thickets of tall bamboo growing in swampy areas. In the belt of rain forest trees which line the course of the river, giant lianas intermingle with the canes of *Calamus* and *Flagellaria*, and grow to the tops of the tall trees in their struggle to reach the light. The effect of this is to concentrate the leaves and flowers on the tops of the trees and to throw a dense canopy over the jungle so that the sun never really penetrates and there is an air of perpetual gloom on the ground below. The dense foliage which becomes entwined and entangled in the tree tops carries masses of flowers, often with a heavy scent, which hangs oppressively on the still air. At night the tree tops where the flowers were concentrated would glow with the eerie glow of thousands of "fireflies" (really beetles of the family *Lampyrdae*) which flew

[1] According to Wollaston the word *kaiya kaiya* means "friend" and has now come into general use for any native throughout much of Dutch New Guinea. The cry "*sabioh*" with which the natives of the Wildeman–Eilanden river area greeted us constantly may possibly have the same meaning.

constantly over the tops of the tall trees; their light flickering and pulsating rhythmically as they flew. Trees of this kind, their tops glowing with white unearthly light, dotted the banks of these rivers.

Towards the estuary of the Digoel the terrain is very different and in brief examination appeared to consist chiefly of low-lying country with Nipa Palm, sago and mangrove swamps. At all the villages close to the water fleets of praus were maintained by the natives. These praus were manned by crews of from two to eight men who generally stood up to paddle. Canoes were provided by the natives at each critical stage and were used to ferry our carriers and their loads for miles through the flooded country.

As they wielded the big long-handled, broad-bladed paddles, driving the canoes through the water at great speed, the natives chanted canoe songs in rhythm with the paddling, their voices echoing down the water lanes—an experience not easily forgotten. Typically these paddles were about 8 feet long, with a very broad blade often finely ornamented with conventionalized or stylized designs generally more or less circular in form.

To one like myself, familiar with the territory on the other side of the Timor Sea—on Cape York Peninsula and in Arnhem Land—the strongly Australian character of the country in the neighbourhood of Okaba was a striking feature. Here the country is clothed with open savannah bushland instead of jungle or rain forest. It consists basically of trees that are very characteristic of Australia, notably Bloodwood and others familiar in the Northern Australian bush, and *Melaleuca* ("Paperbark") trees interspersed with Pandanus or Screw Pines, as well as with Angophora, Red Ash (*Alphitonia philippinensis*) and the Nonda Plum (*Parinarium nonda*)—the latter abundant on Cape York Peninsula, although absent from Arnhem Land. In the swamps and in the low-lying ground, the Leichardt Tree (*Sarcocephalus cordatus*) and a large number of other trees and shrubs which are also characteristic of Northern Australia, occur. In the jungles, Banyan figs of the genus *Ficus*, with strongly developed aerial roots are abundant. Sometimes a large tree spreads over hundreds of square feet of ground. The aerial roots of these trees provide strong fibres which are used by the natives for the manufacture of twine and especially for fishing nets, and the fruit of several species attract the Nutmeg Pigeon and many of the fruit pigeons which are very characteristic of tropical Northern Australia and New Guinea.

Many of the animals and birds to be seen in the Okaba district are also found in Australia as well as in New Guinea. The Blue-winged Kingfisher, the White Cockatoo, the Palm Cockatoo, the Red-sided Parrot, Bower Birds, Catbirds and Friar Birds are all familiar birds in Northern Australia. The Cassowary inhabits the patches of dense jungle, and in the open, flocks of Magpie Geese (*Anseranas semipalmata*) were noted, as well as the White-faced Heron or "Blue Crane" (*Notophoyx novaehollandiae*)—a very well-known bird in Australia—the Jabiru or Australian Stork (*Xenorhynchus asiaticus*), and in the coastal areas, the Masked Plover (*Lobibyx miles*) and the White-headed Shelduck or "Burdekin Duck" (*Tadorna radjah*), other birds which are familiar in North Queensland and the Northern Territory. In the swamp areas Pygmy Geese (*Nettapus* spp.), the Green and White-quilled species, both of which are found in Australia, were numerous.

From Jodom a patrol was made by launch manned by Indonesians, upstream to Tanahmerah, where an Australian garrison was then stationed. Tanahmerah, some 200 miles up the Digoel river, had been established as a convict settlement of the Dutch administration; for prisoners, chiefly political exiles from Indonesia. I was amazed to find buildings of ambitious design and construction, many with floors finely inlaid—a curious feature of some Dutch colonial administrative buildings. From Tanahmerah we returned by launch down the Digoel river, through Princess Marianne Straits, back to Force Headquarters at Merauke.

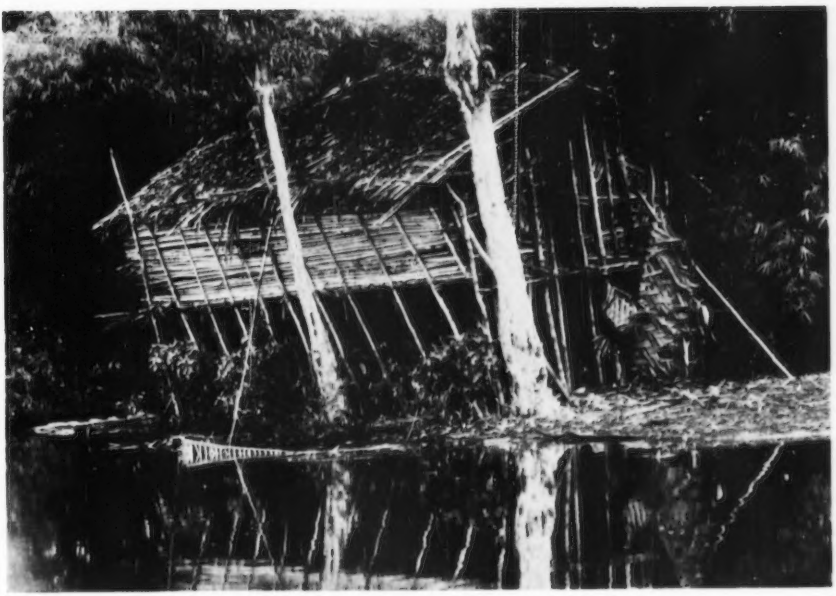
This journey was memorable for its wretchedness. Japanese reconnaissance aircraft were frequently active in the daytime, especially in the early morning, and we had to pull into a side creek and lie hidden during daylight hours under the shade of the overhanging jungle, moving downstream during the night. Frequently the craft ran aground on mudbanks. The native crew knew nothing of discipline, nothing of hygiene, and less of navigation. Although this patrol, on which more than 500 miles had been covered, had occupied less than three weeks, I had learnt much about the country and the swamps, and especially of the rations and equipment that would be needed. On the first patrol we had been issued with only standard Australian Army equipment. Rations only for the personnel actually named in the operation order were supplied—and these were packed in paper bags. A good deal of these were bulky and otherwise quite unsuitable for an expedition of this kind. Within a few hours in the humid heat and heavy rains, the bags disintegrated and blended sugar and coffee with curry powder so that much of this food was soon rendered unfit for use.

The cook on this patrol was not accustomed to the bush, to living on the country or to the natives. He regarded the jungle as an implacable enemy that loomed menacingly on all sides. He looked askance at anything that did not come out of a tin, refused even to taste native food and dismissed it scornfully as "bloody Boong's tucker." His invariable practice was to add another tin of M. & V. ration or bully beef to the dixie and reduce the whole to a common denominator with a liberal admixture of curry powder. That was the only recipe he knew.

The patrol showed at once that the equipment and arms were inadequate, and that no special jungle equipment was available at Force Headquarters. It was apparent that special arms and supplies were essential. I sought, and obtained, permission to fly to Australia for equipment. Back at General Headquarters in Brisbane every possible cooperation was given at last. We now obtained the latest jungle equipment, including American jungle hammocks and packs with rubber-lined bags for clothing and rations. In Melbourne I enlisted the interest of the Officer Commanding Supply and Transport, and obtained special rations packed in tins with press-in lids that could stand in water in the hull of a canoe without damage.

Last but not least I was able to collect three tried Sergeants from the R.A.A.F. who had served with me before. These were Sergeants Gordon Ritchie and D. F. Dick, Armourer-airgunners; and Sergeant V. T. Egan, Wireless-Airgunner-Mechanic. Sergeants Ritchie and Egan had been with me as armourer and wireless operator-mechanic respectively, aboard the

A canoe laden with coconuts



Head-hunter's retreat, made of bamboo and sago palm

Warrior with head-dress of cassowary skin

Head-hunter wearing bird of paradise

Profile showing holes pierced in nose

Plaiting of palm fibres shows social status

Warrior with head-dress of cassowary skin

Head-hunter wearing bird of paradise

Profile showing holes pierced in nose

Plaiting of palm fibres shows social status

Cutting through heavy barriers of floating vegetation

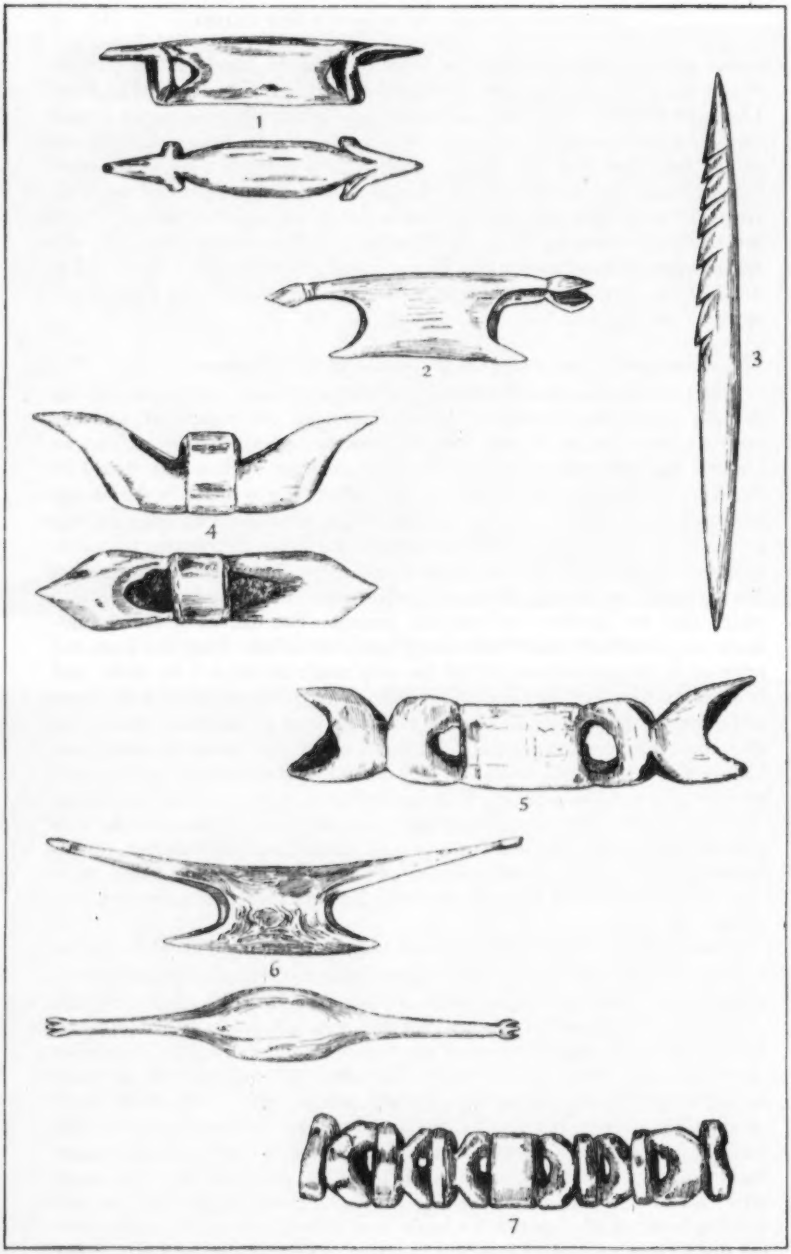
Sergeants Gagi and Egan in touch with H.Q., 200 miles away

armed patrol vessel *Aroetta* on the coast of Arnhem Land and the Arafura Sea in the previous year, and were tried and trusted followers. In addition I brought Sergeant Kapiu Gagi of Badu who had accompanied me on several expeditions before and during the war, and with him four picked Torres Straits Islanders from the islands of Boigu and Saibai—close to the New Guinea coast. The three R.A.A.F. Sergeants were soon known as "the three Georges" from their curious reciprocal use of the R.A.A.F. "George." Each invariably addressed the others as "George." Listening from the depths of a hammock suspended cocoon-like in the middle of the jungle, I marvelled at the intricate conversations which they were capable of sustaining without any apparent ambiguity!

The second patrol; from Mappi to the estuary of the Eilanden

Two previous unsuccessful Dutch patrols had brought back stories of vast floating islands, the "obstacles" which obstructed the waterways, and had recommended the use of explosives to break through these barriers. But we realized that the amount of explosive required for such a task would be fantastic. I therefore determined to establish a reserve depot in a safe area and then to travel light, employing a technique I had used on other expeditions. This was to make friends with the local natives, in this case the head-hunters; to recruit a crew of volunteers; and to use their special knowledge of swamp travel employing their own craft—and the method of travel with which they are familiar—to force the passage. The natives of the swamp-lands are powerfully built with strong heavy shoulders. They are born and grow up in villages between which the only communication is by water, and from earliest infancy they learn to handle small canoes: craft so frail that a white man is incapable even of sitting in them without upsetting them. But even the young children quickly acquire so much skill in the trimming and handling of these fragile shells that they are able to stand up and use a paddle without any conscious effort. The big dugout canoes are up to 60 feet or more in length. They are without keels and are driven by a crew of six to eight paddlers who stand erect as they wield their great long-handled, broad-bladed paddles to the accompaniment of fine melodious canoe songs which echo and re-echo across the water and so help to maintain the rhythmic movement of the crews.

I jettisoned most of the heavy Army equipment, leaving it in a depot on the Digoel river. We left Mappi on the Digoel with only a small plywood launch, a dinghy and two small folding boats. A motor-driven craft, the *Sylvia*, had recently been stationed at Mappi Post and this was made available to me temporarily for transport of stores and equipment. Accordingly I loaded as many heavy stores as possible on to this vessel and put most of my party aboard to relieve the cramped space in the canoes. After a few hours' travel up the Obaa river we ran into flooded country where the course of the stream was obstructed by increasingly large masses of floating weed, and the country became a great lake, stretching away as far as the eye could see. For weeks after this we saw no rivers with high banks, and often there were no perceptible banks at all. Instead, the banks were always low and the trees growing upon them were often standing in water. The only dry land was in the



These drawings are 5/8 natural size

small isolated "islands" dotted about the swamps, on which the villages of the lake dwellers were situated. The native population in these swamps of the upper Obaa river was very large. The people had generally small, meagre gardens, in contrast with those in many other parts of New Guinea, and had to get most of their food from the swamps in the form of fish, fresh water crayfish or "yabbies," and above all, sago. These yabbies were captured in great numbers by setting mesh baskets loaded with pieces of broken termite mound in the water at the fringe of the swamp. The yabbies came to eat the termites and these were so small that the crustaceans had to remain in the basket for a considerable period to satisfy their appetite on this small bait, and big catches were made simply by lifting the baskets out of the water.

In a few places bananas, yams and even coconuts were plentiful, but farther inland the people had almost no gardens at all. There are great areas of sago palms in the swamps. Sago is the staple food of the natives throughout the low-lying coastal country of western New Guinea and the annual harvest of sago amounts to thousands of tons. The only means of transport in these big swamps is by canoe, and canoes were seen in hundreds; many of them upwards of 60 or even 70 feet in length. Such craft proved capable of carrying easily big loads of up to three quarters of a ton, and when heavily laden, with the cargo placed low down in the hull, they were remarkably stable.

The swamp dwellers lead an uneasy, precarious, almost furtive existence. They are still head-hunters, but living on the border-line between the area controlled by the Dutch administration on the Digoel river to the south and the untouched people of the interior who are relentless head-hunters, they are in constant fear of raids. In villages such as Soba, Dagimon and Kepe on the upper Obaa we saw many interesting native types; some of which are shown in the photographs in these pages. Distortion of the nose is practised to a great extent in this area; the nose itself often being pierced and transfixed with a bamboo or other ornament which was beautifully ornamented or intricately carved and worn through the pierced nasal septum. Some of these nose ornaments were of bamboo, but the finely carved specimens were of bone, generally cassowary bone, as indicated by the large medullary cavity seen in cross-section. The hair is also plaited with strips of sago and pandanus palm, and some of these curious and bizarre head-dresses are said to be indicative of a man's social status, and especially to mark prestige gained in head-hunting.

While waiting for the natives to collect sago we ate many hundreds of these yabbies, which turn pink when they are boiled and taste like lobster, but are rather insipid. The natives in the swamps also eat snakes, especially *Hypsirhina* spp. which inhabit fresh water, and I saw them gathering certain

Bone implements from Dutch New Guinea

Figs. 1, 4 and 6 are bone nose ornaments, showing lateral and dorsal views. They are made from cassowary bone and worn by men in the pierced nasal septum. From above Fig. 1 suggests a possible crocodile motif, while the three fingers of each projection on Fig. 6 may symbolize the track or foot of a cassowary. Fig. 3 is an arrowhead of bone, and other nose ornaments are shown as Figs. 2, 5 and 7. When obtained from the natives, all were found to be smooth through use. They appeared to be worn constantly and not only on ceremonial occasions.

fungi which grew on the trunks of trees growing along the Wildeman river and which they ate raw. That these natives had long been in contact with bird of paradise hunters was indicated by the fact that in almost every village they produced containers made from cylindrical tubes of bamboo from which the internodes had been removed and the mouths plugged with paper bark. From these containers they emptied out the skins of birds of paradise carefully prepared and dried, which they presented for inspection. Wherever we travelled the natives produced these plumes as offerings, holding them aloft to attract our attention as they stood up in their canoes, thinking perhaps that the quest of the bird of paradise was the only incentive that would induce the white man to penetrate these remote areas.

In the swamp villages I recruited seventy-five picked natives, with twenty-five canoes, with which I hoped to find a passage which would lead us into the Wildeman river to the north and then into the Eilanden. Each of the natives was presented conditionally with a big jungle knife or parang which these people value very highly. The knives were to be used for cutting through the floating obstructions or barriers of grass and other vegetation, and each man was promised that he could keep the knife if he completed the job and went with us through all the barriers until we reached open water. The natives were to feed themselves, for our own stores of rice were insufficient to provide for seventy-five men. On this account we had to remain in the swamp villages for two or three days to allow the people to collect enough sago to last them for about a fortnight on the canoe journey to the north.

Conditions in the swamps were severe in the extreme. Leeches and mosquitoes were present in incredible numbers, the heat was intense and rain fell almost incessantly. Even when we did reach solid ground we had the greatest difficulty in lighting a fire, and wherever possible sought refuge in the abandoned house of a head-hunter. These houses were raised on piles, high over the water. Beneath them, mud and every form of filth lay decomposing in a foetid mass. But at least it had a floor and a dry thatch of *attap*, made from Nipa palm or Pandanus leaves, and we were able to sleep and to cook some food, after long days in the rain.

Day after day we threaded our way among "islands" of floating water plants. When the vegetation was too dense even for the canoes to be driven through in single file, we had to jump into the water and slash through the dense floating vegetation with long knives to prepare a channel. After hours of hacking and slashing while treading water—for the water in the swamps was often very deep—we would force two walls of floating grass apart by lying against one side and thrusting with our feet against the other wall. Into the breach which at length appeared, a single canoe hull would be forced until gradually a channel opened. The aquatic vegetation in the main morass which is drained in the south by the Obaa, and in the north by the Wildeman, differed greatly from the floating barriers which obstructed the channel of the upper Wildeman river when the course of this stream became defined. In the swamps the vegetation was mainly of rank aquatic grass. But in the channels of the rivers the chief component of the barriers was a rank plant with alveolar tissue which made them very buoyant. They had broad leaves, deep green in colour, growing to a height of 6 or even to 8 or 9 feet, or more.

This plant differed from the aquatic grasses in that it floated in deep water, which often gave a sounding of 12 or 14 fathoms, and had no connection with the bed of the stream or with its banks. The plant, which has been identified by L. S. Smith,[1] of the Queensland Botanic Gardens, as almost certainly *Hanguana malayana* (Jack) Merr. (=*Susum anthelminthicum* Bl. ex Roem & Schult.) grew in dense masses sometimes covering acres of deep water and completely obstructing the course of the stream.

That these barriers or obstructions in the Wildeman had been in existence for a considerable period was indicated by the fact that large trees frequently grew in the organic material which had been collected. At intervals, probably at times of excessive rain, masses of the floating plant broke away and floated down stream, and at the time we made the passage from the watershed of the Obaa to the Wildeman they were choking the course of the upper Wildeman. There were eight or nine of these barriers in all, which had to be negotiated. Once we had emerged from the swamps of the upper Obaa into the defined course of the Wildeman they varied in depth from about 100 feet to a quarter of a mile and were scattered along the course of the stream with good open water between.

The humid "hot house" air in the low-lying mangroves was intensely depressing, a feeling that all members of the party shared—although nobody spoke of it then. We would have given anything for the sight of a hill or even the chance to climb a tree: sometimes we did, to learn the extent of a floating barrier and to look for open water ahead. Two previous attempts to force this passage had failed and soon after we had started I had told the members of my party that we would not turn back. But our strength was ebbing quickly. Every task was an effort to which we had to drive ourselves. The days seemed interminable. But even these were preferable to the long hot, restless nights in which we sweated and tossed under mosquito nets—naked because there seemed to be no movement of air through the close mesh. One slept fitfully, hearing the patter of rain on the canopy of the net, the drone of countless mosquitoes from the swamp around, the croaking of frogs and the monotonous metallic call-note of the Nightjar. This time we slept in American Army jungle hammocks with waterproof canopy overhead. These hammocks were strung cocoon-like between the boles of two conveniently placed jungle trees and so had the merit of providing a dry bed and protection during the night from the hordes of mosquitoes in the swamps. But there seemed to be no air.

I well remember the quiet, steadfast courage of Sergeant Kapiu Gagi of Badu Island, Torres Straits. Kapiu had been with me in Arnhem Land for years and was a first-class waterman. He was strong and he had no nerves. He could work and when the tension was over he could sleep like a log. He did not fret and worry and waste nervous energy. He was at his best during the task of driving through the dense heavily matted grass or cutting through

[1] I am indebted to Mr. Smith for his painstaking work in determining the identity of this plant and for the reference to Flora Malasiana, Ser. I, Vol. 4, part 3, p. 249, Dec. 1951, in which appears a photograph. Sir Edward Salisbury, Director of the Royal Botanic Gardens, Kew, also considers that the identification by Mr. Smith is probably correct.

barriers of floating weed. He was powerful—massive is a better word—impassive; even stolid. But he could laugh—a laugh half-way between the angels and Rabelais. I remember still, out of the nightmare of that journey, how he stood beside me at the helm of the little launch in the rare stretches of open water. Towards the end of this journey his ankles started to swell so that as I turned where he squatted at the helm of the little plywood launch I could see the skin so taut that it shone. Great baggy swellings appeared under his eyes, and he wiped his eyes constantly with a dirty rag that he held in his right hand. His left gripped the tiller. But he never complained. The air seemed grey, the atmosphere yellow and a perpetual stillness and a gloom hung over the place. No wind stirred the water in those narrow water lanes; the air seemed still and heavy, as if there was no breath. One worked as long in the dusk as one could to avoid lying awake at night—thinking.

Sometimes the negotiation of a barrier occupied a few hours, at other times days were needed. Often nightfall caught us in the middle of a barrier, nearly one hundred men, cold, wet and hungry, with no dry land in sight. Often we had to push the men beyond their normal endurance because it was unsafe to camp until we had passed through or until we were so deeply involved in a barrier that the natives could not make off with their canoes during the night. We gave all that we had, but sometimes, when we knew our strength was failing and looked back to our positions 100 miles behind, and the known Japanese positions that we had to reconnoitre, nearly as far ahead, despair came very close. Ahead, how far we had no idea, was open water, freedom and success—if our strength lasted and we could cut a passage. No clean dry land, no good solid earth, no open water. But instead there was always the ooze, those interminable bamboo thickets, the long grass, the treacherous masses of floating water plants that by their size suggested dry land where they floated in 14 fathoms.

But at last, when we had cut through one long heart-breaking barrier of grass, I noticed that the water was no longer still. It was flowing very slightly, and the flow was to the northward! We were on the headwaters of the Wildeman, and open water must be somewhere ahead. The first and most difficult part of our mission was successful. From this time on we encountered increasingly long stretches of open water in which progress was good, and at length emerged in the well-defined channel of the Wildeman river. Between barriers there was often 12 or 14 fathoms of clear water in the channel. No dry banks were along the course of the Wildeman; only tall jungle trees fringing the waterways, casting a gloom over the dark water.

Our native carriers were now far into hostile country and were daily growing more apprehensive and anxious to return. By bribery and every other device, I induced them to accompany us until we had cut through the worst of the barriers which lay between us and the open channel of the Wildeman. We used every form of guile to hold them, but at length I purchased from these people two of their biggest dugout canoes, paid them off with presents of fishhooks and knives and sent them home. They went with two Indonesian Police who I hoped would hold them together and get them back to their own territory.

We lashed the two canoes together and built a raft or platform between

them. The hulls were then loaded almost to the "plimsol mark" with small sealed drums of rice and petrol, our most treasured stores, and on the platform we built a shelter thatched with palm leaves or *attap*. On this I mounted four Bren guns and finally established Sergeant Vincent Egan, the wireless operator, with his batteries and charging motor on it. By day we laid the "houseboat" with her precious cargo against the bank of the stream, camouflaged her carefully, and lay in wait for enemy patrols. At night she emerged from hiding into open water and floated silently downstream in the darkness.

For some time the only natives we had seen had been men, all armed to the teeth with fighting arrows. The complete absence of women and children was an ominous sign. They were very timid, watching us furtively from hiding, and often stationing sentries in the tops of tall trees to watch our movements. Human heads festooned almost every hut we passed and hung in clusters like bunches of grapes. Heads of freshly killed victims were impaled on tree stumps. There were few villages and these were either very strong with sufficient population to beat off attack, or small and isolated and built high on piles over the water or in the trees; or hidden on the edge of the jungle, their walls slotted to permit the use of bows and arrows. For weeks we saw no gardens at all and met fewer people. None of these were friendly. They moved with the timid furtive movements of animals haunted by fear. Incessant head-hunting has rendered life so precarious for these people that they are still mainly hunters and collectors; they have no chance to make gardens. The houses were either very large communal affairs, each of which sheltered many people and were clustered close together for protection against raiders, or they were built singly and scattered along the watercourses on the edge of the jungle—so that the inmates could drop into the water and escape in canoes, or slip quietly into the jungle and hide if head-hunters appeared.

So far we had seen no evidence of Japanese patrols, but at the junction of the Wildeman with the Eilanden river, where there were some dry huts, deserted, on a piece of relatively dry land which commanded a view of the junction of the Wildeman and Eilanden, I established a camp for a day or two. I wanted to watch the meeting of the rivers and to try to discover whether the Japanese were in active occupation of the area. The natives watched us from canoes a long way off, crying always "*Sabioh sabioh!*" and fleeing at our approach. The Eilanden river here was very wide and deep. Always the natives watched us from their canoes far out in open water, or occasionally they changed their tactics and approached close to the banks of the river. They stood up in their frail canoes, which were almost fragile in contrast with the great war canoes of the swamps. As people approached they held up the golden plumes of birds of paradise as a lure and cried aloud "*Sabioh!*" If we waited patiently and made no move, they would sometimes venture close enough to reach out and take a fishhook or knife, but their paddles were held tense and ready in the water and they were poised for immediate retreat. Generally they stood with one foot in each gunwale for instant flight.

As we drifted slowly down the Eilanden, the natives who had been fearful and timid became more numerous and bold. They showed by their behaviour

that they had encountered strangers before, who were interested in the plumes of the birds. The natives also made sounds like "phut! phut!"—perhaps to tell us that the Japanese were, or had been, in the area, for now open water lay ahead; a clear channel right down to the sea. But still we met no signs of actual enemy occupation. A few days after entering the Eilanden we reached the estuary, the first part of the mission completed, and established camp about 20 miles from the nearest Japanese headquarters. Here we found that the natives were bold and their demeanour treacherous, although there was no sign of any firearms. They had obviously been in contact with the Japanese. As well as bows and arrows, they now carried knives, axes and machettes.

But always they watched our movements. They signalled to one another from canoes stationed offshore, by splashing with their paddles so that the white water could be seen for miles against the dark background of the jungle. I established the wireless operator, Sergeant Egan, and most of the party of native troops in a base camp, and with Sergeant Ritchie, Kapiu of Badu and two or three other natives, pushed on down the Eilanden to make a reconnaissance of the estuary. The natives on the lower reaches of the river had been in close contact with the Japanese to the northward and had recently been strafed by fighters from our own headquarters. But, except that the area buzzed like a hornets' nest and that something was seriously amiss, we knew nothing of what was happening.

Early one morning as we were breaking camp on a narrow open strip fringing the jungle, the natives crowded us and attacked *en masse*, two hundred strong. We were overwhelmed, and three of us—Ritchie, Kapiu and myself—were severely wounded before we could get our Tommy guns into action. The natives were armed with steel axes which they wielded with a flourish like the battle axes of old; with great knives and machettes; and with their own heavy stone axes and clubs. The Japanese, from motives of prudence and self-preservation, did not equip these natives with firearms. We were submerged by the weight of the attack and overwhelmed by numbers. I myself was wounded three times. But the very smallness of our party and the overwhelming weight of the attackers was in our favour. After the first onslaught they could not see where to hit. We turned our machine guns on them and on the canoes moored along the foreshore. Then under cover of Bren gun fire we carefully collected and embarked our equipment.

My next problem was to start the motor launch. My left hand and shoulder were out of action; I could manage the throttle or the choke but not both simultaneously. But we got her under way at last and retired upstream to Egan's hideout. About forty hours later a Catalina, escorted by Kittyhawks, came over. She brought a relief party and embarked our wounded. Half my operation order was still untouched but we had succeeded in the essential part of our mission. The existence of a connection by water between the swamps of the Obaa and the Eilanden river had been established and proved. A long stretch of waterway had been explored. And we had found the site for an outpost on the lower Eilanden.

THE NEW POLITICAL GEOGRAPHY OF INNER ASIA

OWEN LATTIMORE

INNER ASIA may be described as a group of regions that have neither a frontage on the sea nor navigable rivers leading to the sea. Under this definition northern, but not southern Iran, and western, but not eastern, Manchuria may be regarded as Inner Asian regions. Most of Inner Asia either touches or stands astride of the Soviet frontier in Asia—the longest frontier in the world, stretching from Turkey to Korea. Tibet, lying distant from Russia, is a notable exception to this rule.

An important characteristic of Inner Asia is that most of its political frontiers do not mark the edges of territories inhabited by peoples who differ from each other in language, economic activity, social organization, and in the kind of group loyalty that is founded on a feeling of kinship. They divide kindred peoples from each other and place them under different political sovereignties. As a consequence there is an important difference in the political geography of the frontier zone as between Inner Asian regions and other regions; in Western Europe, for example, where different peoples have lived in adjoining territories for many centuries. This contrast is shown diagrammatically for the French–German frontier in Figure 1, and for the Russian–Mongol–Chinese frontier in Figure 2.

Figure 1

Both sketches are drawn to illustrate a phenomenon of great importance in political geography: the fact that the difference between two neighbouring peoples is usually nowhere near as sharp as the line drawn on the map. Normally, the frontier "line" is in fact a legal abstraction; what exists on the ground is not a line but a zone—but there can be more than one kind of zone.

A man going on foot from France to Germany, walking not more than 20 or 30 miles a day, finds himself at first among people who, allowing for provincial differences, may be called "standard" Frenchmen. As he goes along, he finds a gradual increase in the intermingling of those characteristics that, taken as a group or complex, we call "German" and those we call "French"; first a larger number of loan-words in the local dialect, then more bilingual people; a gradual increase, in territory politically French, of house-types and cultivation practices that are usually associated with Germany, and so on. At or near the frontier line of the map he finds the maximum intermingling of French and German; then, as he goes on, a shading off through Germans with decreasing marks of French influence, until he is among "standard" Germans.[1]

[1] For some observations on phenomena of this kind, made by a man going on foot from the fringes of Germanic Europe toward Latin Europe, see Hilaire Belloc, 'The path to Rome,' London, 1902.

In the mingling that takes place on such a frontier there is a tendency toward the formation of a frontier people, having not only identifiable geographical location but recognizable political characteristics, different from those of the two adjoining "standard" peoples. These peculiarities are registered in our vocabularies in such terms as 'Borderers,' 'Marchmen' and 'Grenzleute,' echoing the fact that historically the political loyalties of frontier populations have on occasion been of decisive importance. The man of the border may at times be even more intensely and fiercely loyal than most of the "standard" people with whose country he identifies himself; but perhaps more important, if one judges the characteristics of a frontier population by its group behaviour rather than by the behaviour of outstanding individuals, is the phenomenon of equivocal loyalty and the tendency to go with the winning side.

Figure 2, which is based on the fact that for a long time there was a nominal linear frontier between China and Russia, and which therefore disregards, for the purposes of the present stage of the discussion, the separate political sovereignty of Outer Mongolia, illustrates a different kind of frontier zoning. Among the French–German marchmen there can be distinguished a group which combines the maximum of both "Frenchness" and "Germanness." On the Russian–Mongol–Chinese frontier this is replaced by a group that shows the minimum of either "Russianness" or "Chineseness." The traveller from China to Russia leaves "standard" Chinese behind him as he enters Inner Mongolia. He passes through a zone of Chinese colonists showing at first very faint and then somewhat increasing Mongol influences; then a zone of maximum Chinese–Mongol combination; then a zone of Mongols showing progressively decreasing Chinese influence in the way of houses instead of tents, practice of agriculture, knowledge of the Chinese language, and use of Chinese loan-words in the local Mongol dialect. When he reaches Outer Mongolia, he is in the zone of "full Mongolness." Speaking schematically, and disregarding for the moment very recent Russian influence in Outer Mongolia, he has in this zone left everything Chinese behind but has not yet encountered anything Russian. As he goes on north however and approaches and enters Buryat Mongolia, he passes through zones of increasing Russian influence, maximum Russian–Mongol combination, decreasing Mongol influence, until he finally reaches a fully Russian territory.

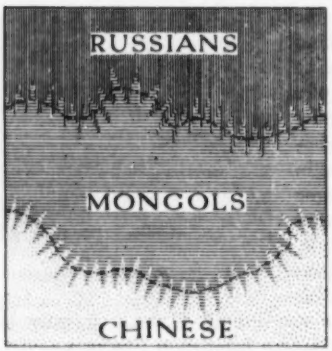


Figure 2

This schematic zoning of the Russian–Mongol–Chinese frontier is repeated in Sinkiang, where again there is a zone of minimum Russian and Chinese influence.[1] The triumph of the Chinese Communists has brought about one

[1] Most of the Russian frontier with Manchuria, except for the Barga region, which

major change which now distinguishes the Soviet frontier with Sinkiang and Mongolia from the Russian frontiers with Afghanistan, Iran and Turkey. Whereas the Mongols of Outer and Inner Mongolia and the Turco-Mongol peoples of Sinkiang were until then sandwiched between Russian and anti-Russian, Communist and anti-Communist governments, they are now enclosed between governments that are controlled by Communists and closely allied with each other.

West of Sinkiang, the old pattern still stands. Afghanistan is a multi-national state, its northern fringes inhabited by minority peoples. The Kirghiz of the Wakhan Pamir of Afghanistan are identical with the Kirghiz of the Russian Pamirs. The Afghan Tajiks are identical with the Tajiks of adjoining Soviet Tajikistan. Farther west, the Turkish-speaking groups on the northern frontier of Afghanistan are more similar to the Turkish-speaking peoples of adjoining Soviet Uzbekistan and Turkmenistan than they are to the majority groups of Afghanistan, which speak Persian and Pashtu.

In Inner Asia the tendency toward equivocal loyalty and the tendency to try to go with the winning side at moments of crisis is enhanced by the fact that the divided frontier people has no sense of kinship with either of the major nationalities between which it is divided. This condition underlies what has been called the "axiom of frontier administration that a tribe or group of tribes situated between two comparatively powerful States must be under the influence of one or other of these" [1]—for where the sense of kinship does not operate, other forces, such as military power, class interest, or the opportunity for an individual career act all the more strongly.

The former stabilization of the frontiers

This "multiple" zoning of Inner Asian frontiers is accounted for by the expansion toward each other of the Russian and Manchu Empires in the seventeenth and eighteenth centuries, the expansion of the Russians toward Iran, Afghanistan and India, culminating in the nineteenth century, and the projection of the power of Great Britain toward the inland frontiers of China and the Inner Asian frontiers of Russia, also in the nineteenth century—a projection based partly on India and partly, as in the case of Iran, on naval power. The mutual suspicions excited by expansion were most acute in the nineteenth century. Then, at the turn into the twentieth century, there came a remarkable stabilization, remarkable because it resulted in very nearly the maximum satisfaction to Russia, China and Great Britain alike.

Four principal events deserve to be called the pillars of this stabilization. First, by the Anglo-Russian Pamir boundary settlement of 1895, the Russian and British Empires were separated by allocating to Afghanistan a narrow corridor of territory joining up with territory which both were willing to recognize as Chinese, thus extending previous agreement on the delimitation

in both political and physical geography is an eastward extension of Mongolia, does not belong to Inner Asia and will therefore not be discussed here. Most of this frontier is marked by the Amur and Ussuri rivers, and shares the general characteristics of river frontiers. The tribal remnants of peoples that are neither Russian nor Chinese are here not numerous enough to form a screen between Russians and Chinese.

[1] Quoted, without identification, from "an eminent statesman," by Sir Kenneth Wigram, "Defence in the North-west Frontier Province," *Journal of the Royal Central Asian Society*, Vol. 24, 1937, p. 74.

of the northern frontier of Afghanistan. Secondly, the Younghusband Expedition to Lhasa in 1903–4 initiated a firm outline of British policy in Tibet: the British in India to have direct access to Tibetan authorities; in negotiations between Britain and China concerning matters of direct Indian-Tibetan interest, the British recognized the right of the Tibetans to have participating representatives; while the British, of their own volition, would not convert access to Tibet into occupation of Tibet. Thirdly, by the important Anglo-Russian Convention of 1907, both countries agreed not to penetrate Tibet and rivalry over Afghanistan was eliminated. Persia (Iran) was divided into a northern zone in which Britain would seek no concessions and oppose no concessions made to Russia, a middle zone in which both countries might seek concessions, and a southern zone to be dominated by Britain. Finally, in 1911, in connection with the Chinese Revolution and the parallel revolution in Outer Mongolia against both Manchu and Chinese rule, the Russians inaugurated an Outer Mongolian policy that was a remarkable parallel to the British policy in Tibet. I do not know of any comparative study of these two policies, but such a study would be a contribution of great value to our understanding of the conditions in which an empire deliberately ceases to expand. The Russian policy included the right of direct access to Outer Mongolia, Outer Mongolian representation in discussions between Russia and China about Mongolia, no annexation, and discouragement of pan-Mongolianism—that is to say, no detachment of Chinese-ruled Inner Mongolia for the purpose of attaching it to Outer Mongolia. This policy was reinforced by secret agreements with Japan (since published), deliminating the Japanese sphere of influence in eastern Inner Mongolia.[1]

It was in the midst of this process of stabilization, and before it had been completed, that Sir Halford Mackinder first drafted his concept of a world political geography based on stabilization of the balance between sea-power and the "heartland" through the midst of which runs the Russian frontier in Asia. His thinking, throughout the rest of his long life, continued to be directed toward stabilization; the great shifts of power consequent on the First and Second World Wars could, he believed, still be readjusted to continue the general stabilization achieved at the turn of the century.[2]

A pregnant sentence in Mackinder's first outline of his theory, in 1904, is the key to the counter-theories of Haushofer and the German geopoliticians. Mackinder wrote: ". . . it may be well expressly to point out that the substitution of some new control of the inland area for that of Russia would not tend to reduce the geographical significance of the pivot position." Because of his concern for the balance between land-power and sea-power he did not like the idea that the Chinese might some day control this pivot area; that, he thought, "might constitute the yellow peril to the world's freedom just

[1] Ernest B. Price, 'Russo–Japanese treaties of 1907–1916 concerning Manchuria and Mongolia,' Baltimore, 1933.

[2] The principal references are: (Sir) Halford J. Mackinder, "The geographical pivot of history," *Geogr. J.* 23 (1904) 4; 'Democratic ideals and reality,' London, 1919, reprinted with text unaltered, New York, 1942; "The round world and the winning of the peace," *Foreign Affairs*, New York, July, 1943, reprinted in slightly different form in 'Compass of the world,' ed. H. W. Weigert and V. Stefansson, New York, 1944.

FINLAND
Leningrad
Moscow
SOVIET SOCIALIST REPUBLICS
Union of
Ob'
Lena
Sea of Okhotsk
Lower Tunguska
Volga
Irtysh
Yenisey
Stalingrad
Astrakhan
Omsk
Krasnoyarsk
Novosibirsk
Lake Baykal
MONGOLIA
Amur
Chita
KAZAKHSTAN
TANNU TUVA
BURYAT MONGOLIA
Barga
MANCHURIA
Vladivostok
Ulan Bator
OUTER MONGOLIA
KOREA
Baku
Caspian Sea
Krasnovodsk
TURKMENISTAN
UZBEKISTAN
Syr Darya
L. Balkhash
KIRGIZSTAN
Tashkent
Kalgan
Peiping
Tehran
Amu Darya
TAJIKISTAN
Tien Shan
Yellow Sea
IRAN
SINKIANG
CHINA
Kabul
AFGHANISTAN
PAKISTAN
KASHMIR
Changan
Jihang
Nanking
Shanghai
TIBET
20°
30°
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50°
60°
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120°
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150°
160°
50°
40°
30°
60°
80°
90°
100°
110°
120°

because they would add an oceanic frontage to the resources of the great continent." [1]

Haushofer's ideas consisted largely in taking the very factors on which Mackinder counted as the props of stability and using them to upset, in Germany's favour, Mackinder's postulated stabilization between Britain and Russia. Mackinder, in his 1904 paper, wrote that "The oversetting of the balance of power . . . would permit the use of vast continental resources for fleet-building, and the empire of the world would then be in sight. This might happen if Germany were to ally herself with Russia." It was precisely such a combination of Germany and Russia that Haushofer wanted; his geopolitics inspired Hitler's cry: "If I had the Ukraine"—though Hitler substituted the ambition of conquering Russia for Haushofer's hope of alliance with Russia.[2]

Our problem to-day is to compare the new political geography of Inner Asia with that effected by the stabilization of half a century ago and to determine, if possible, whether the changes that have taken place since the Second World War are still susceptible to Mackinder's ideas of a kind of stabilization that is modified, but not swept away, by change.

Mackinder founded his superstructure of political geography on a stabilization of strategic and economic geography. The Anglo-Russian agreement on the Pamirs had been preceded by years of exploration which had provided the reassuring knowledge that, at this back door of India, there were no routes through the great mountain masses for wheeled artillery or large modern armies with heavy equipment. The stabilization in Tibet was based on the realization that Tibet was a similar barrier, and contained no numerous and warlike frontier tribes; simply by not advancing into Tibet, India could be saved the expense of maintaining on her north-east frontier the military establishment necessary on the north-west. The stabilization in Iran was based on the frank allocation to Russia of a zone in the north strategically dominated by the Russian Army, a zone in the south where control was assured by British sea-power, and a neutral zone between. The stabilization in Mongolia was based on the assurance that the Russians wanted Mongolia to remain a wide buffer, not to be actively developed, and did not propose to use it as a forward area for the preparation of an advance against Japan's sphere of influence in south Manchuria.

Economically, the situation of half a century ago was one of virtual stagnation. Though they differed in the modes in which they gathered strength within themselves and expanded, the empires of Russia, China and Britain all encountered geographical limits of diminishing returns, and in Inner Asia these limits roughly coincided.

Chinese expansion was limited by the ability to absorb non-Chinese populations. Throughout their history, the Chinese have been willing to accept as Chinese any barbarian who would drop his language and learn Chinese, wear Chinese clothes, farm like a Chinese and accept the other

[1] Writing on the eve of the Russo-Japanese War, Mackinder was able to think of the Chinese only in terms of their being "organized by the Japanese."

[2] For a useful discussion of the ideas of Mackinder and Haushofer in comparison and contrast, see Hans W. Weigert, 'Generals and geographers,' New York, 1942.

conventions of being a Chinese. Toward the south, the Chinese were able to expand to an almost indefinite depth because they found in their southern territories tribes which, in agriculture and the evolution of their social systems, were still in phases through which the Chinese themselves had already passed. Such peoples could be absorbed by a process of accelerated evolution, in contact with the Chinese culture, to the levels prevailing among the Chinese. They could, in fact, be called "not yet Chinese," to distinguish them from the non-Chinese peoples of Inner Asia.[1]

As they expanded toward Inner Asia, the Chinese encountered kinds of terrain that could not be mastered by the characteristic Chinese techniques, confronting them with the alternative of either changing their direction of specialization, thus becoming less Chinese, or ceasing to expand. The inhabitants of the Tibetan heights and the Mongolian plateau engaged in farming in a limited number of sheltered valleys only. Most of them lived by "extensive" economic practices (herding, with a fringe of hunting), and trade among them depended on relatively long caravan journeys, in contrast to the "intensive" Chinese practices of irrigation wherever possible, multiple cropping, and short distances to market between towns and their surrounding countryside. The two forms of society, one dispersed and the other concentrated, were alternative, and could not be amalgamated. Accordingly, when Tibetan highlanders or Turco-Mongol herdsmen invaded China they abandoned their old practices, took up those of the Chinese, and rapidly "became Chinese," in all respects, including language; but when Chinese moved into typically Tibetan or Mongol terrain, it was they who "became barbarians," and with equal rapidity.

Sinkiang was a partial exception. The structure of a Sinkiang oasis, with its walled town or towns and irrigated, closely cultivated fields was comparable to the Chinese "cellular" [2] unit of town and surrounding countryside. It is not surprising therefore that while the Chinese were content with indirect control, supervision and manipulation of local potentates in Tibet and Mongolia, the tendency in Sinkiang was toward direct administration under the Chinese civil service.

These comparisons explain why Chinese expansion toward the south and south-west never reached a zone of diminishing returns, as it did in Tibet, Turkistan and Mongolia. It is true that over a long period of history Chinese armies have at various times campaigned successfully deep in Outer Mongolia and far into what is now Russian Central Asia; but such campaigns were primarily for the purpose of breaking up threatening concentrations of tribal power in the trans-frontier, not for the purpose of acquiring new territory, administering it directly, and integrating it closely with China. It was all too obvious that to go beyond the zone of diminishing returns did not result in an accretion of strength or wealth, but in a drain on the economy of China proper. In the seventeenth and eighteenth centuries, when the Manchus established overlordship in Outer Mongolia, Sinkiang and Tibet, they were

[1] *Cf.* Owen Lattimore, 'Inner Asian frontiers of China,' 2nd ed., New York, 1951, p. 56.

[2] In 'Inner Asian frontiers of China,' cited above, pp. 39–40, I called these units "compartments."

able to mobilize very great striking forces; but there is no evidence that, even if they had not encountered the expanding power of Russia, they would have attempted to push their own expansion farther. They halted roughly along what had been, throughout Chinese history, the classical line of maximum expansion.

Like the Manchu-Chinese Empire, the Russian Empire did not spread beyond its ocean shores. Alaska, the one exception, was given up. As in the Chinese Empire, the power of the state stood within one vast, continuous land-mass and, theoretically, could be applied as autocratically at the confines of empire as at the heart. The economic and social texture of the two empires however was different. Russian agriculture was much more extensive than that of the Chinese; irrigation was insignificant, and the use of forest products and livestock much greater. Walled cities there were; but there was not the same concentrated landscape of frequent walled towns, each with a closely settled, closely cultivated area grouped tightly around it; and, on the contrary, the vast feudal estate in the struggling Russian countryside was far more frequent than in all but a few outlying areas of China.

The mode of growth was also different. The Russians "incorporated" where the Chinese "absorbed." For many centuries there was an ebb and flow of conquests between South Russia and the Inner Asian steppes. When the Slavs were defeated, Turco-Tatar-Mongol khans had the upper hand; but they admitted Slav chieftains and nobles to the lower ranks of their own nobility. When the final conquests went in favour of the Russians, they in turn took into their service chieftains of the Asian steppes. Whichever way the tide turned, there was no race prejudice; there was intermarriage both among commoners and among nobles. An outcome of this long process was that class politics became more obvious and familiar than race prejudice through the phenomenon of the man or family of the ruling class who went over to the winning side in time, in order to avoid losing everything, instead of fighting to the end.

From the early Cossack expansion of the sixteenth century to the final Russian conquests in Inner Asia in the nineteenth century, the outcome was a state in which the ordinary, unprivileged person, whether he spoke Russian or Turkish, was a subject rather than a citizen, while the privileged classes were privileged regardless of language, religion or other cultural characteristics. By the time the Russian Revolution broke out, therefore, the lines of cleavage between Russians and non-Russians were less sharp than those between privileged and unprivileged, and the Tsarist forces in Inner Asia were largely defeated, not by national movements against Russian rule, but by a kind of civil war in which the privileged non-Russians stood, on the whole, on the Tsarist side, while the unprivileged non-Russians either stood aside from the struggle, as far as they could, or made common cause with the Russian revolutionaries.

Economically, however, the Russian Empire was weakly bound together. As in the case of China, the economics of transportation were important, though in a somewhat different way. There had been a considerable growth of capitalism and industrialization in Russia in the nineteenth century, but it was retarded by sluggish transportation. With the exploitation of overseas

empires and with investment by Europe in North and South America, the cheap carrying of bulk cargoes by water between nations and between continents greatly increased the margin of profit and the rate of capital accumulation and fresh investment in Western Europe. The handlers of capital investment in turn became the most active driving force within the society as a whole—the real "political enterprisers" as well as the men of financial enterprise. In Russia, capital enterprise did not spread with an equal liveliness all over the country; capitalists tended to stay close to the favour and patronage of the court and the great landed aristocracy; and because they sought wealth through patrons they did not acquire within the society the kind of power that would have enabled them to do without patronage. Even when railways were pushed out into the Inner Asian territories acquired in the second half of the nineteenth century, they served industrialization poorly—or rather, the industrialists were slow to use them competently. The moving of cotton from Turkistan to the textile mills of Western Russia and Russian Poland, and of finished cotton goods back to Turkistan, all by rail, was far less profitable than the British importation of cotton and export of textiles by ocean transport.

Largely because of the clumsiness inherent in the Russian combination of patronized capitalism and Tsarist autocracy, the Russian land-contained expansion also had its zone of diminishing returns, and it so happened that this zone coincided largely with the zones of diminishing returns of the Chinese and British Empires. It has long been a convention to describe the Russian potential of expansionism in Asia as illimitable, under Tsarist and Soviet rule alike; but there can be no doubt that Pavlovsky is right in distinguishing, from the eighteenth century right up to the period of the Second World War, between a "colonial" or "activist" group and the "cautious and conservative statesmen" who sought to limit expansion.[1] In the rivalry between these two groups the distinction was worked out, over a period of more than two centuries, between annexable territories and those which, lying in the farther zone of diminishing returns, should not be annexed. It was thus that the trans-Baykal, up to the Amur, and the Maritime Province, east of the Ussuri, were step by step annexed—the final annexation, in 1944, being Tannu-Tuva or Urianghai. As a remarkable instance of the Russian tenacity in holding to a long-term aim of policy, it is to be noted that from the early eighteenth century they had maintained a distinction, in all their dealings with the Manchu-Chinese empire, between Tannu-Tuva and Mongolia. With equal consistency, the "conservatives" always succeeded in maintaining that Mongolia and Sinkiang were not to be annexed.

British expansion towards Inner Asia also had its zone of diminishing returns, eventually reached in mid-Iran, Afghanistan, the Pamir–Karakoram heights, and Tibet. The process of British empire building was accumulative. Its territories were acquired separately, by the combined strategic and economic use of sea-power, and one of its structural principles was that the integration between each part and the centre, in Britain, should be stronger than the integration between the separate parts. India was penetrated from

[1] Michel N. Pavlovsky, 'Chinese-Russian relations,' New York, 1949, especially pp. 28, 32, 45–46, 58.

the sea, and its rail and road net attached the hinterland to the seaports and to international trade. In its economic development, the constantly recurring problem was to find the point at which the overland cost of bringing raw materials, semi-processed, or processed commodities from the hinterland to the ports and into world trade became so high as to offset the cheapness of ocean transport and the economic efficiency of industrial Britain.

It is not astonishing that the economic boundaries thus discovered coincided with the mountains that made convenient strategic frontiers. The turbulent North-west Frontier with Afghanistan provided the Indian Army and part of the British Army with constant training; but if it had been necessary to back the Pamir frontier and the Tibetan frontier with comparable forces, India would have been bankrupted. Hence the desirability of maintaining Tibet as an empty buffer zone between India and China was greater than the desirability of prospecting for minerals there; and hence, also, the desirability of a standstill agreement with Russia in the Pamirs and in Iran.[1]

The present position

Since the First and Second World Wars, all the conditions of stability and stagnation in the frontier regions described above have been destroyed. Around the maritime margin of Asia there is no longer a strong structure of British, Dutch, French and Japanese imperial power, in which the United States participated, as far as China was concerned, under the Open Door principle. The United States, while not itself holding concessions in the Treaty Ports, benefited as much as any other country from such privileges as extra-territoriality, the operation of banks and other enterprises free of Chinese Government control or regulation, in the Treaty Ports, and navigation, including the movement of naval vessels, in the territorial waters and up the rivers of China.

Fifty years ago the strength of this structure around Asia was so great that it gave to such capitals as London, Paris, The Hague, Tokyo and Washington —especially when they were willing to act in conjunction—something closely approximating to a power of decree within Asia. No such power now exists. Even though fighting is now going on in Korea, Indo-China and Malaya, we should delude ourselves if we expected the outcome, in any of these three cases, to be a re-establishment of the power of full control. In each case a holding action is being fought, the best outcome of which must be soberly accepted as no more than an improved position for modifying, by negotiated agreement, the former situation.

Changes in the heart of the continent correspond to those around the margin. India, as an independent republic, cannot base its policies either in Tibet or in the controlled states of Bhutan, Sikkim and Nepal, on the same concepts that underlay British policy. These territories have become part of a "live" and extremely sensitive zone between India, a newly independent

[1] The foregoing comparisons between the Chinese, Russian and British types of empire were first sketched by me in an address before the American Historical Association in Washington, D.C., 29 December 1948, never published in full but cited in condensed form in *Atlantic Monthly*, Boston, March 1949, and in 'Situation in Asia,' Boston, 1949, pp. 14–18.

country, and China, a country under a totally new kind of government in both its domestic policies and its international relations. India and China, as new kinds of state arising in post-war Asia, must necessarily review the whole question of their common land frontiers. The post-war redistribution of power would make such a review necessary regardless of the forms of government in India and China, as is shown by the fact that the succession state of Pakistan has been forced by comparable necessities to take up afresh the entire question of its hinterland frontiers.

Even more sweeping is the change in the old frontier structure between China and Russia. Mongolia and Sinkiang are no longer buffers between China and Russia, nor are they zones of diminishing returns in the expansion of China or Russia. They have become, instead, zones through which communication between China and Russia is imperatively necessary. At present, the only line of rail communication is from Siberia through Manchuria into North China. But, since it must be a major policy aim of the governments of both China and Russia to attach themselves to each other more closely, we must expect in the near future that the Manchurian line will be backed by a second line (not yet announced), through Outer Mongolia from Ulan Batur (already connected with Siberia by rail) to Kalgan, and by a third line, already announced, still deeper in the hinterland, from the Turk–Sib Railway through Sinkiang and Kansu into Western China.

From 1911 to 1920 Outer Mongolia was a satellite of Tsarist Russia, independent in fact of China. From then on, first as a "constitutional monarchy" and then, after the death of the Living Buddha, as the Mongolian People's Republic, it was equally a satellite of Soviet Russia and still more independent of China. Throughout this period there was inevitably a strong element of anti-Chinese feeling in Outer Mongolia: the Mongols retreated into closer association with Russia because of their greater fear of China and, later, of Japan. With attachment to each other now the overriding aim of both China and Russia, it is obvious that no taint of anti-Chinese political feeling will be allowed among the Mongols. The new relationship between China and Russia makes rather unreal the recurring speculation that Outer Mongolia will be annexed as a member of the Soviet Union. Any one of a number of alternative devices could be adopted; one, for instance, might be the reorganization of Mongolia, Sinkiang and Tibet as Federated Republics within a Chinese Union of Republics. The major consideration is that both Chinese and Russians can adopt policies that are locally pro-Mongol, or pro-Sinkiang, as long as local feelings of separate cultural and linguistic identity are clearly subordinated to the overriding need of China and Russia to communicate with, and attach themselves, to each other.

We are accustomed to the concept that economic developments have social and political consequences. In the case of China and Russia however great economic consequences may be expected from the political decision on a strong alliance. The railway history of China is a history of gradual penetration of the hinterland, developing the flow of trade toward the seaports. Sun Yat-sen dreamt of lines through Mongolia and Inner Asia, but in practice the large and immediate return on lines subordinate to coastally oriented trade meant that nothing was done about lines into the deep

hinterland, requiring heavy capital outlay for a possibly long-deferred return.

Present conditions are different. Economically and strategically, China is making a right-angled turn away from the coast and toward Inner Asia. China's only known large oil deposits lie in Kansu and Sinkiang. There are also other mineral deposits in the deep hinterland. The development of industrial complexes is, theoretically, more profitable than the extraction of a single raw material; but much of the north-western territory is either desert or agriculturally poor and thinly populated. It is to be expected that the Chinese, and the Russian planners and technicians working with them, will go a long way toward a policy of moving population to build up industrial centres in the deep hinterland, as an alternative to moving raw materials by expensive overland transportation to the thickly populated coastal provinces.

These considerations enable us to view more clearly the conditions of the Inner Asian frontiers farther to the west, between the Soviet Union and Afghanistan (Soviet territory does not quite touch Pakistan or India, because of the Afghan corridor), and the Soviet Union and Iran and Turkey. Here there still persists that division between communist and non-communist governments that has been wiped out in the zone between China and Russia. Here also there is still the overlap, between different sovereignties, of minority peoples numerically weak but strategically situated.

In this region foreign intervention against the Soviet revolution ceased in 1920, and though local anti-revolutionary resistance continued for a couple of years, especially in inaccessible desert and mountain regions, the strategic frontiers were thenceforth clearly dominated by the Soviet Union. By the end of the Second World War, the degree of dominance had become more indisputable.

Within this period, economic and industrial development on the Soviet side of the frontier underlay the growth of strategic power. In Turkey there were also changes that made the country quite different from what it had been before 1914, both in its foreign policy and in the internal structure of political loyalties. In Iran and Afghanistan however virtual stagnation continued.

Thus in analysing the change from an assumption of permanence to an atmosphere of wariness along the vast chain of Inner Asian frontiers, we must clearly take into account the political effect on men's minds not only of changing ratios of strategic power but of change or lack of change in their daily lives. On the one hand in Soviet territory and to a significant degree in Turkey there were changes in traditional occupations and the opening up of new opportunities. In a changing society, the individual could climb to positions of prestige, which gave him social satisfaction and promoted a willingness to support the kind of state offering these opportunities. On the other hand we must evaluate the opposition generated by loss of status and well-being among those adversely affected by these changes, and the tenacious support of the old order, in countries like Iran and Afghanistan, of those whose interests were vested in it.

There is a considerable literature on the development of Soviet Inner Asia. For the sake of brevity I select a single example, an American study

published in Britain, representative of the wide range of knowledge available and of the traditional academic standard of trying to set out all the relevant facts before drawing conclusions.[1]

This paper should be consulted for the details, but the general conclusions may be briefly summarized here. Russians have made the top economic decisions and have held the chief executive and technical posts, despite the theory of linguistic and cultural autonomy. Similarly, though education and social services have been extensively developed, non-Soviet nationalisms have been restrained. The basic principles have been the movement of industries closer to raw materials or fuel and power, and intensive economic development as a means to full communication. Railway construction has been especially notable, and major industrial developments include coal, oil, electricity, and non-ferrous metals. Cultivation has increased more than the cultivating population, indicating a marked rise in the productivity of labour, probably due to collectivization and mechanization. The increase of livestock has fallen behind the planned figures. This may perhaps be because pastoral nomads are more difficult to collectivize than settled farmers; if so, that is an important conclusion, which however the author does not draw.

The author concludes (i) that the Soviet planning system makes it possible to pump capital into backward areas, thus achieving the same result as the import of capital would have had under a capitalist system; (ii) that the Inner Asia standard of living is below that of European Russia, itself lower than that of Western Europe, but the average level of well-being has certainly risen; (iii) as a result, a small but important percentage of the native inhabitants have probably become "very loyal and very convinced Communists"; (iv) that the population shifts could not have been accomplished without some degree of compulsion; (v) that, as Inner Asia lags behind European Russia, an essentially colonial relationship still exists, from which the Soviet system provides no way out by evolution.

The author finally raises the "open question" how far and how fast Central Asia could have developed under a healthy capitalist system. He does not answer the question, but says that capital would have had to come from outside, and that "considerable Government subsidies would probably have been necessary for such intensive development under capitalism."

Future changes in the new political geography of Inner Asia largely depend on this "open question." An economic and social revolution carried out according to plan and backed by force causes great displacements of population, much suffering, and a bitter resentment that sometimes breaks out into revolt and sometimes is quenched in unsuccessful conspiracies; but there are also some who benefit. If those who benefit hold the key positions they can win out, even if they are a minority; and later, if the benefits spread, there is a shift of numbers toward the support of changes that have been brought about. This phenomenon is not limited to planned economies and collectivized societies. There was something similar in the combination of rural

[1] Paul B. Henze, "The economic development of Soviet Central Asia to the eve of World War II. An examination of Soviet methods as applied to a semi-colonial area," *Royal Central Asian Journal*, 1949, pp. 278–96, and 1950, pp. 28–44.

displacement and the creation of an overworked, underpaid urban proletariat in the English industrial revolution. There is also something similar in the problems of such countries as India and Pakistan to-day.

No political change in fact can take the form of simply building additions to an old structure. There is always, to some degree, a destruction and discarding of parts of the old structure. In the execution of any programme of action such as the British Colombo Plan, the American Point Four programme, or United Nations Technical Assistance, the critical point is not the complete and sudden creation of industrialism in unindustrialized countries, but the initiating of a momentum that convinces enough people—not necessarily a majority—that the right road has been found; that things are sufficiently improved this year, in comparison with last year, to justify the belief that they will be still better next year.

In Inner Asia, the new political geography can best be defined by the frontier between revolutionary and evolutionary methods. Because of this frontier, it is no longer sufficient to describe Soviet Inner Asia as a still colonial or quasi-colonial area peripheral to a centre of gravity west of the Urals. For one thing, a large part of Inner Asia is no longer peripheral, but intermediate between centres of gravity in Russia and China; a change that will certainly influence its development in new ways. In both Soviet and non-Soviet Inner Asia, moreover, the question of "lag" is not a simple but a double question. The fact that Soviet Inner Asia has not yet caught up with the overall Soviet standard is obviously important; but it is probably even more important to know whether the lag between the non-Soviet periphery and its centres of gravity is greater than that between the Soviet periphery and its centre or centres. It very probably is: and therein lies the critical definition of the political geography of Inner Asia and the critical problem both of the non-Soviet West and of non-Soviet Asia. New processes of stabilization, to take the place of those that underlay the thinking of Mackinder, can only be created by deliberately initiating, on the non-Soviet side of the frontier, changes that match in their potential of growth the changes going on in Soviet territory. Only a counterbalance of change can satisfactorily replace the stabilization of inertia of half a century ago.

DISCUSSION

Evening Meeting, 14 January 1952

Before the paper the PRESIDENT (Mr. J. M. WORDIE) said: Our lecturer, Dr. Owen Lattimore, is head of the Institute of International Relations at Johns Hopkins University, Baltimore. That Institute was founded by Walter Hines Page, the distinguished American who was the United States Ambassador to Great Britain during the First World War.

Dr. Lattimore has travelled extensively in Inner Asia, and especially in Mongolia. He first explored there in 1926 and 1927 when he made a journey from Pekin to India, then westward into Sinkiang, where he was joined by his wife. Together they passed through Kashgar and into northern India. After a long life spent in those parts, mingling travel with scientific observation and forming shrewd ideas about the country, its people and its politics, he was awarded in 1942 the Patron's Medal.

Dr. Lattimore then read his paper

The PRESIDENT: We have with us this evening the Chairman of the Council of the Royal Central Asian Society, Admiral Sir Howard Kelly. We should be pleased if he would address us.

Admiral Sir HOWARD KELLY: I have enjoyed the lecture immensely but I confess I have been a little disappointed. As you all know, Professor Lattimore is one of the most controversial figures of the age and I had rather hoped he would throw down some challenge to us, and that we might hear some reference to the differences of policy between the Americans and the British in the Far East. It is unfortunate that our views differ so widely. I cannot help feeling that if the Americans had with us recognized the *de facto* government of China many of the difficulties we are facing at present would have been avoided. If only we could both decide on a common policy in the Far East it would be to the benefit, happiness and peace of the world.

Professor DUDLEY STAMP: I have been asked to contribute to the discussion as a representative in this country of academic geographers. For more than a quarter of a century those of us who have been concerned with geographical problems in Asia have found a blank, to a large extent, in our maps in the heart of Asia. This has been a gap in our knowledge, and we have always turned to the writings of Dr. Lattimore for objective information in regard to that area.

He is associated at present with the Johns Hopkins University, and there is a name which will always be revered in this hall and everywhere in this country amongst thinking people; and that is Dr. Isaiah Bowman. It was Dr. Bowman's great work as President of the Johns Hopkins University to gather together in his School of Geography a group of really first-class brains who should lead the world to study objectively the scientific background of some great problems of the day. I know that it would be Dr. Bowman's great satisfaction and pleasure, had he lived, to have seen part of his hopes for Johns Hopkins realized. Dr. Lattimore has put before us some of the great factors in the development of Asiatic problems. He has not answered some of the questions he has posed, but he has given us all something to think about.

On the one side we heard him stress the solidity of the frontiers with the U.S.S.R. and the principles behind that solidity; the development of industrial areas close to the frontiers, not for political reasons but for those perfectly clear to any academic geographer. And then on the other side of the frontier there were those countries so less united at present; Persia, Afghanistan, India, China and Japan.

I feel sure we would all wish to endorse most heartily the suggestion that it is time for the western democracies and those associated with our subject to work together in the attempt to solve some of the great problems which were foreseen by our own leader; Sir Halford Mackinder.

On behalf of the academic geographers I see well represented in this audience, I would like to express our deep appreciation of this thoughtful and most interesting lecture.

Mr. PETER FLEMING: I cannot possibly speak as an academic geographer, but I would like to pay tribute to Dr. Lattimore as a traveller. Many among the audience may or may not have read his book 'The Desert Road to Turkestan,' in which he described his journey from Pekin to India. In there you can read about the journey in which his wife joined him. It is not only an extraordinary book of travel but will probably be regarded in future years by all interested in the area as a "source book," because he travelled the country with a full knowledge of the various languages involved; as well as knowledge of the geography, politics and customs of the people.

I was once fortunate enough to be taken by Dr. Lattimore for a long week-end to Inner Mongolia and I must say it was a most enjoyable experience. I can recall one incident which well illustrates the Chinese character. We were lucky enough to obtain a sleeper with two berths when we travelled on the little railway running up from Pekin to Kalgan. There was the usual sort of scare owing to some civil war, and at the provincial frontier the Chinese guard in the middle of the night came along the train and wanted to inspect the two foreigners. The attendant in charge of the sleeper, a very nice chap who had already been liberally rewarded and told we were not to be disturbed, put up a gallant fight, but the Chinese guard obviously felt he had to show his importance, too. After much argument and after the attendant had said firmly that he could not let the guard enter the sleeper and wake up "those two distinguished foreigners," they worked out a compromise. Finally the Chinese guard said: "One is English and the other American. Which is which?" And, pointing through the door as he stood outside in the corridor, the attendant replied: "The American is on that side and the Englishman on that side." Honour was satisfied and the Chinese guard went away.

To me one of the most interesting and significant remarks Dr. Lattimore made was when he asked why the Russians incorporated in their territory that small republic of Kurgan Tyube. It may well be that the answer to that question would provide the clue to the whole of their policy. The Russians have that enormously lengthy frontier of something like 10,000 miles from the Caspian and the eastern end of the Black Sea round to Vladivostock. No point on that frontier in modern history has been strongly held except when the Japanese got an army into Manchuria and then it was very strongly held. The frontier is not for the greater part of it a natural one, but there is nothing to stop anyone walking across at any time they like. As far as that eastern frontier of Russia is concerned, the only lesson we can learn from the history of the last seventy years or so is that the Russians are not a nation acquisitive for land in Asia. Now I should like, on behalf of all present, to thank Dr. Lattimore for a most interesting and informative lecture.

THE EQUATORIAL NILE PROJECT AND ITS EFFECTS IN THE SUDAN

A paper by members of the Jonglei Investigation Team [1]

THE CONSERVATION of water and the control of rivers for irrigation and hydro-electric power are of increasing importance in the world to-day. Growing populations and higher standards of living in areas which only a few decades ago would have been called backward, are causing increasing demands on natural resources. The production of more food has become a matter of vital concern, not only to localized communities but to mankind as as a whole. There are few places where these observations apply more acutely than the Nile valley. In its long course the White Nile passes through a great variety of country each with its local problems, as does the Blue Nile descending from the Ethiopian hills to their junction at Khartoum.[2] Both rivers provide for the irrigation schemes of people in the Northern Sudan and Egypt, and farther upstream for the livelihood of those dependent on its natural rise and fall. Both rivers cross national frontiers and are a matter of wide concern, for wise compromise and goodwill must prevail if any system of control in the future is to benefit all those who have a natural right to a share in their waters.

The Equatorial Nile Project, or to give it a lengthier but more descriptive title, the Victoria-Albert-Jonglei Scheme, is only one part of the most comprehensive hydrological plan yet put forward for control of the Nile. The other parts of this general plan are, first, the Lake Tana Scheme which involves an overyear storage reservoir designed to increase the water supplies in the Blue Nile for irrigation in Egypt and the Sudan, to provide a supplementary reserve and to assist in flood protection for both countries; and second, the building of one or more reservoirs on the main Nile between Atbara and Wadi Halfa [3] for annual storage and flood protection. All these projects are in the long run mutually interdependent and the maximum benefits cannot be achieved except by the combined use of all three; though each independently will have the effect of producing more water for irrigation. We are here concerned only with the Equatorial Nile Project. But it is as well to remember that this Project, itself a vast undertaking, is part of an even larger one. It must be remembered, too, that even if it is decided to embark on the Tana or Main Nile Schemes before the Equatorial Nile Project, the latter, the most complicated and extensive of them all, cannot be shelved indefinitely.

As will be seen later, the Project will have the effect of altering radically

[1] Prepared by past and present members of the team and edited by P. P. Howell. The opinions expressed here do not necessarily represent the official views of the Sudan Government.

[2] The distances are: White Nile, Luvironza Source–Khartoum 2300 miles; Owen Falls–Khartoum 1600 miles. Blue Nile, Little Abai Source–Khartoum 1075 miles. Main Nile, Khartoum–Rosetta 1880 miles.

[3] Another possible site is the Wadi Rayan in Egypt.

the existing regime of the White Nile in the Sudan between the Sudan–Uganda frontier and Kosti in the north. The repercussions, moreover, on the lives of the people who live in the riverain belt along this reach of the Nile will be drastic. For this reason the Sudan Government set up in 1945 a special Commission known as the Jonglei Investigation Team to examine the implications of the project and where necessary to suggest remedies.

The White Nile to-day

The most distant source of the White Nile is the Luvironza river which flows into Lake Victoria, the second largest freshwater lake in the world. The only outlet to this lake is at Jinja where the Victoria Nile, as it is here called, descends at first in a series of falls and rapids, then slowly through Kioga, a lake largely covered with papyrus and other vegetation which retard the flow. Then it goes fast again over another series of rapids ending in the Murchison Falls, and finally enters Lake Albert. This lake receives a good deal of water from the Semliki river which rises in the Ruwenzori Mountains or Mountains of the Moon. It is thus another source of the Nile, but its only exit is at the northern end where the river flows northwards through a flat plain, which is really an extension of the Lake Albert basin, as far as Nimule on the Sudan–Uganda frontier. From the mouth of Lake Albert to Nimule, the river is sometimes called the Albert Nile, but the whole reach of river down as far as Lake No is called in Arabic the Bahr el Jebel and it is by this name that it is usually known. At Nimule, the river plunges once more through a narrow, rocky gorge in a series of rapids and fast-flowing reaches until it enters the Sudan plains just below Rejaf. In this reach it is joined by a number of torrents which add a good deal of water in the rainy season, but at other times of the year are dry.

Hereafter the scenery changes. On either side of the river a fringe of green vegetation, inundated with water when the river is high, to a greater or lesser extent dries out when it drops. The distinctive feature of the river from here on is this border of marshland gradually increasing in width until, after passing through the Aliab valley where it is several miles across, it enters the region known as the Sudd.

Here the main channel of the river, supplemented by numerous side channels, is narrow and winds its way in a serpentine course through the thick vegetation of the swamps which extend for miles on either side. At one point water is taken off through two artificial cuts into the Bahr el Zeraf which rejoins the main channel below and is thus used as a distributory. At Lake No the Bahr el Jebel is joined by the Bahr el Ghazal which derives its water from the west in a different catchment area; but its contribution is negligible and the river, now called the White Nile, takes a sharp turn to the east. It is first joined by the Bahr el Zeraf again, and then a few miles downstream by the Sobat river flowing in from the east, deriving its water from the Abyssinian highlands and hence again from a catchment area different from that of the main river. This river comes down in spate during the rainy season and contributes a large volume of water almost equal to that of the Nile itself. After this the White Nile leaves the Sudd area and turns north again while the bordering swamps and marshland begin to narrow, being confined by high

land on either bank to a width of about a mile. It then flows slowly northwards through the reservoir of the Jebel Auliya Dam until it joins the Blue Nile at Khartoum.

This short description of the White Nile system gives some idea of its course, but there are some distinctive features which must be grasped if we are to understand not only its present regime, but also the methods of control which will be necessary in the future. In the first place, the seasonal aspect is all-important. In the south from about April onwards, and in the north from about June, the river starts to rise as the water which has fallen on its main catchment in the area of the Great Lakes begins to take effect. It is then supplemented by local rainfall over its lower reaches, until in November in the south and January in the north, when the dry season begins, the levels start to drop again. Secondly, in the reaches where there is no steep bank and especially in the Sudd area where the river is flanked by low marshes and swamps, usually well below the top of the river banks, the water spills over and inundates the surrounding country. Because the movement of the water is slow and the surface large, the evaporation and transpiration through the mass of vegetation are extraordinarily high. Hence vast quantities of water are lost long before the river reaches the tail of the swamps. In fact, it is estimated that in an average year 27 milliards (27,000,000,000 cubic metres of water) enter the Sudd region at Mongalla, but only 14 milliards emerge, the rest being lost in this process of spilling and evaporation. When we consider that nearly a metre of rain is precipitated over the area as well and is also lost, the amount of these losses appears phenomenal. These features are best represented diagrammatically. In Figure 1 the course of the Nile is shown from the Great Lakes to Khartoum. The heavy shading on Figure 1 shows the marshland and swamp which is inundated when the river levels are high by water spilling in from the main channels and from the hinterland. When the river drops this area largely dries out, leaving great stretches of drying grassland interspersed with deep water courses, lagoons and pools which only dry out late in the dry season, or sometimes not at all.

THE EQUATORIAL NILE PROJECT: CONTROL OF THE WHITE NILE

In July, the Blue Nile and the Atbara rivers come down in flood and provide more than sufficient water for irrigation purposes until about December. Part of the White Nile is held back by the Jebel Auliya Dam until the Blue Nile flood is past, but it is not large enough to provide full control. The Equatorial Nile Project [1] has therefore been devised, one of its primary objects being to hold back the flood until it is required for irrigation purposes farther north. This is what is called "annual storage," in other words control of the river to suit irrigation requirements at any given time in any one year.

A further and even more important objective is to control the water so as to ensure that these requirements are met not only in any one year, but also

[1] Many schemes have been suggested. The Project described here is put forward by Hurst, Black and Simaika in 'The Nile Basin, Vol. 7. Future Conservation of the Nile,' Egyptian Ministry of Public Works, Cairo, 1946.

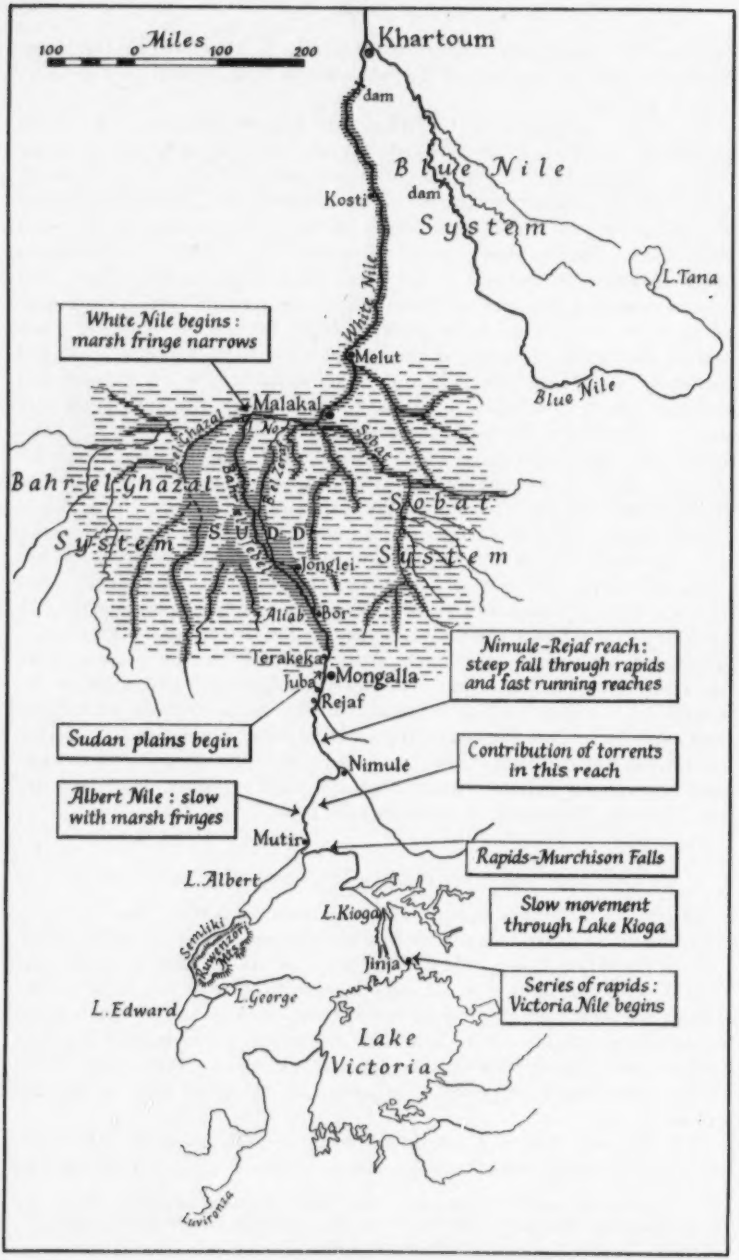

100 0 Miles 100 200
Khartoum
dam
Blue Nile System
Kosti
dam
L.Tana
White Nile
White Nile begins: marsh fringe narrows
Melut
Blue Nile
Malakal
Sobat
Bahr el Ghazal System
SUDD
Sobat System
Jonglei
Aliab
Bor
Terakeka
Juba
Mongalla
Rejaf
Nimule-Rejaf reach: steep fall through rapids and fast running reaches
Sudan plains begin
Nimule
Contribution of torrents in this reach
Albert Nile: slow with marsh fringes
Mutir
Rapids-Murchison Falls
L.Albert
L.Kioga
Slow movement through Lake Kioga
Semliki
Jinja
Series of rapids: Victoria Nile begins
L.George
L.Edward
Lake Victoria
Luvironza

Figure 1

every year. Naturally, the rainfall in the catchment area of the river is variable and in some years the volume of the flood is much less than in others. It is therefore necessary to store water in years of good rainfall, when the water is in excess of normal requirements, for use in years when the water would otherwise be inadequate. This is known as "Overyear" storage and necessitates a very large reservoir indeed. The perfect scheme for overyear storage would guarantee the same discharge in the river every year. This should be equal to the average over a long period of time. The longer the period over which this is to be maintained, the larger the storage capacity must be. The problem has been studied by Dr. H. E. Hurst, formerly Director General of the Egyptian Physical Department, and he has applied the results of his investigations to the records of the discharges from Lake Albert which are available since 1904. In doing so he has assumed one hundred years as the period over which the desired amount of water or quota is to be maintained; in other words he has worked out what storage capacity would theoretically be large enough to maintain a given quota for ninety-nine years out of one hundred on the average. This is called "century storage" and the resulting figure, though large, is obtainable in Lakes Victoria and Albert.

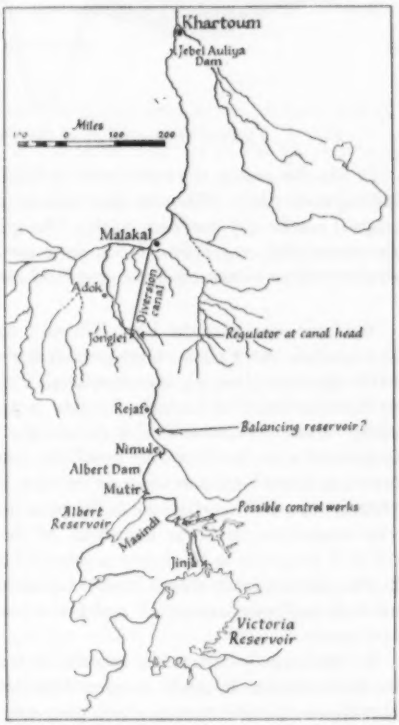


Figure 2

Since there is little direct connection between the causes of rainfall in Abyssinia, which gives rise to the Blue Nile, and in Uganda, the source of the White Nile, there is only small correlation between the discharges of these two rivers. In the final stages of these schemes for Nile control, it will be possible, in a year of good rainfall on one catchment, to cut down the amount of water released from the other and thus in effect store the surplus of the first. This principle is known as "virtual storage."

We have already seen that a vast quantity of water is lost in the Sudd region and that any plan for storage and control farther upstream would be useless unless these losses could be eliminated. In order to do so it is proposed to dig a canal to bypass the Sudd area, which will be known as the Jonglei Diversion

Canal.[1] It will leave the Bahr el Jebel at Jonglei, at present only a small Dinka village in the middle of a swampy reach of the river, and rejoin the White Nile near the Sobat mouth about 280 kilometres below. By carrying the bulk of the water through this canal it will be possible to run the natural channels of the river at a very low level and below that at which, in normal circumstances, water spills over into the surrounding swamps. (See Fig. 3.)

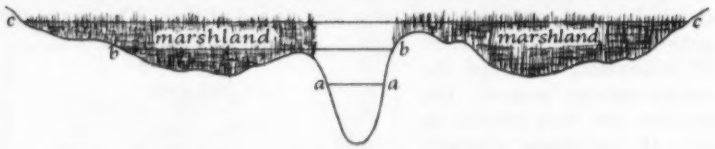


Fig. 3. Typical cross-section of the Bahr el Jebel in the Sudd area

In the dry season when the river is low, the level is at (a) and little or no spilling takes place. When the river rises to (b) it will spill over the left bank, and when it reaches (c) over both banks. The spill is at least partially held back by the surrounding vegetation, but is none the less considerable. The object of the Project will be to run the river at a level somewhere well below (b).

We have seen that the Blue Nile and Atbara come down in flood in July and provide more than enough water for irrigation for about half the year, while the natural supply is inadequate for the rest of the year. It is customary to describe the first period—roughly from July to December—as the "untimely season" because at this period the White Nile flood is not required. Combined with the Blue Nile flood, the total is in excess of irrigation requirements and much runs to waste in the sea. The second period is known as the "timely season," in other words the period when additional water is required. The water stored in the reservoirs of the Great Lakes must therefore be released to arrive at the lower reaches of the Nile during the timely season. During the untimely season it must be held back, and limited only to sufficient water to maintain navigation and prevent excessive weed growth in the river and canal.

By discharge is meant the amount of water which passes a given point in the river system. It can be measured by the number of milliards or thousands of millions of cubic metres which pass in a year, or the number of millions of cubic metres which pass in a day (m/d). Under the Equatorial Nile Project, the discharge at Mongalla, above the Sudd region, will be 27·2 milliards; 17·3 milliards of this will be allowed to pass in the timely season, and the remainder in the untimely season.

The discharges through the natural channel and the canal will be controlled by a regulator at Jonglei and are shown diagrammatically in Figure 4. The final result will be that 22 milliards in the year will emerge at the tail of the swamps below the mouth of the canal, instead of the present average of 14·2.

[1] Other methods which have been proposed include artificial banking of the natural channels. Modern machinery may well make this method safer and less expensive than previously supposed.

This makes a gain of 7·8 milliards, of which 6·9 milliards will be available in the timely season.

The conditions so far described will extend to Buffalo Cape on the Bahr el Jebel and Fangak on the Bahr el Zeraf (see Fig. 5) and would continue beyond these points were it not for the backwater effects of the river Sobat. Under present conditions the river Sobat contributes $13\frac{1}{2}$ milliards in the

Fig. 4. Cross-section at Jonglei when the canal has been dug to 55 m/d capacity

In the timely season 85 m/d will be passed through: 55 m/d in the canal and 30 m/d in the river. The levels will then be at (t) in the river and (x) in the canal. In the untimely season the discharge will be altered to 17 m/d and 35 m/d respectively and the levels will be at (u) and (y). Thus, though there will be a great difference of level in the canal, the river will remain more or less constant and always well below the level at which water would spill over the banks.

year, most of it during the untimely season when it comes down in flood. In the future the levels below it at Malakal will not alter appreciably, even though only a small quantity of water will be coming from the canal at this time of year. In the timely season, when the Sobat drops, the canal will be running to full capacity. Hence the discharge in the river below the Sobat mouth will remain fairly constant and the present fluctuation of river levels will be very much less than it is now. This alteration will begin at the places already mentioned because of the backwater effect of the Sobat in the untimely season and of the canal in the timely season.

Before turning to the problem of how these methods of control which alter the present regime of the river will affect the present livelihood of the inhabitants, there is one other condition which is of primary importance. With century storage, it is always possible that a very high flood may occur when the reservoir is full. Should this happen at Lake Albert, it would be necessary to pass the entire flood downstream at once, with disastrous consequences in the riverain area below. It is therefore essential to reserve a certain amount of the total storage capacity of the reservoir for use solely in such an emergency, so that the excess water can be let through in reasonable quantities over a longer period of time, and thus prevent flooding below. This is known as flood protection storage.

The necessary volume of flood protection storage depends upon the assumed maximum inflow into the reservoir and the permissible maximum outflow during the crisis. The problem is a complex one and cannot be discussed here in detail. The conclusion so far reached by the Jonglei Investigation Team is that a capacity of 40 milliards over and above normal storage capacity is required specifically for flood protection purposes, and that the

critical period during which the flood could be allowed to escape in quantities small enough to prevent damage might be as long as four years. It is essential that the discharge at Mongalla should never exceed 120 m/d. Here another factor must be considered. The torrents which enter the Nile between the mouth of Lake Albert and Rejaf must be counter-balanced by adjusting the flow through the Albert Dam. From a purely technical point of view, the best site for this purpose is at Nimule, but for other reasons it may be necessary to build it at Mutir nearer the mouth of Lake Albert. If Mutir is finally chosen as the site, it would take some time for the counter-balancing adjustment made at the dam to be felt in Mongalla. In these circumstances it would be necessary to protect the Southern Sudan by building one or more balancing reservoirs between Nimule and Rejaf; the total capacity required for this purpose being about $1\frac{1}{2}$ milliards.

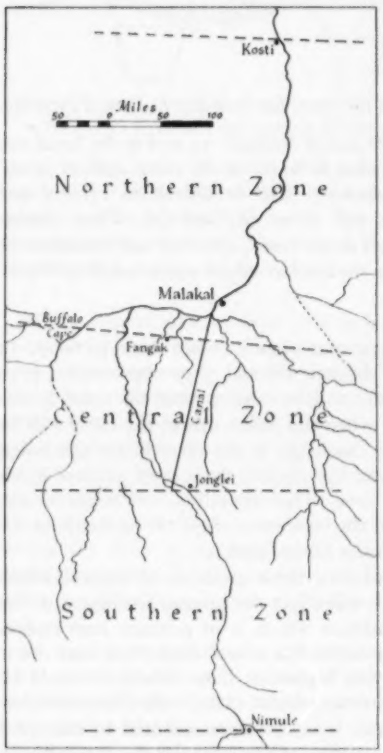


Fig. 5. Hydrological changes

A similar situation will arise between Lakes Victoria and Albert, for these two reservoirs will be operated in combination. At present the variable and uncertain time lag in Lake Kioga would make this impossible, and it is proposed to overcome the difficulty by building a control work at the outlet of this lake, thus converting it into a balancing reservoir.

The Equatorial Nile Project therefore consists of the following works, the position of which may be seen on Figure 2.

1. A dam at the Owen Falls to provide storage capacity in Lake Victoria.[1]
2. A dam near Masindi Port to convert Lake Kioga into a balancing reservoir.
3. A dam at either Nimule or Mutir to provide storage capacity in Lake Albert.
4. One or more dams between Nimule and Rejaf to provide balancing

[1] This dam is now under construction at Jinja. The primary object at the moment is the production of hydro-electric power for Uganda, but, by agreement between the Governments of Uganda and Egypt, it has been modified to suit the needs of the Equatorial Nile Project in the future.

The swamp area of the Central Zone

Air photograph of the Bahr el Jebel, 8° 40′ N, 30° 13′ E. The main channel can be seen flowing northwards. The permament swamp and marshland extend for many miles on both sides.

Phot. Sudan Surveys Department

The Fola Rapids below Nimule

The Nile near Terakeka

The Kinyeti Valley

The Aliab Valley

River transport on the Bahr el Jebel

Digging soil samples in papyrus swamp

reservoirs for counteracting the effects of the torrents. (The capacity needed will be small if the Albert Dam is built at Nimule.)

5. A canal, with a regulator across the river, to bypass the Sudd region from Jonglei to the mouth of the Sobat.

All these works are part of the integrated whole; no part can be used effectively without the other parts.

Changes in the river between Nimule and Kosti

The first reach of the river in the Sudan which will be affected by the Project is between Nimule and the canal head at Jonglei. This is now referred to as the Southern Zone. Since the dam will be open during the timely season, the river will be high and roughly equivalent to its present maximum. During the untimely season, the river will be low and nearer to its present minimum. This is the exact opposite of what happens now and the natural seasons will be reversed. In the next reach of the river, from Jonglei to Buffalo Cape on the Bahr el Jebel and to Fangak on the Bahr el Zeraf, the effects will be different. The natural channels will be kept running at a low level to prevent spilling and there will be no great seasonal fluctuation. The major proportion of the water will, as we have seen, be taken by the canal. This reach is known as the Central Zone.

North of these two points the river will remain permanently at a high level and, for the reasons already described, there will be less seasonal variation in water levels. During the untimely season the levels will remain high by reason of the Sobat flood; during the timely season they will stay high because a higher discharge will be coming through the canal. This applies to the river as far north as Melut, but below that the effects of the Jebel Auliya Dam will be felt, causing a greater variation in water levels. The whole reach from Buffalo Cape and Fangak to Kosti is known as the Northern Zone.

The position as shown on Figure 5, is as follows:

	Present	*Future*
Southern Zone	River high in the untimely season, low in the timely season.	River low in the untimely season, high in the timely season.
Central Zone	Rivers, including both the Bahr el Jebel and the Bahr el Zeraf, high in the untimely season and low in the timely season.	Rivers permanently low to prevent spilling.
Northern Zone	River high in untimely season, low in timely season.	River permanently high with only small variations.

THE HUMAN PROBLEM

Something of the aims, working arrangements and effects of the Equatorial Nile Project has been described. We must now consider how these radical alterations in the natural regime of the river will affect those people who live

along the Nile in this region and make use of its natural fluctuations. From near Rejaf, where the river enters the plains, natural conditions are on the whole best suited to a pastoral economy. During the rainy season from April or May until December, the Nile, supplemented by the accumulation of local rainfall, overflows its banks and inundates the surrounding marshes. At this time of the year the people are compelled to move to higher ground where the land is better drained and free from flood. Here they build their permanent villages, graze their cattle in the immediate vicinity and cultivate. Conditions change rapidly when the rains cease. The cultivation season is over, the crops are harvested and grasses dry out or have been consumed. Water supplies begin to run short and the herds are driven on to the wide plains which in level are between the so-called high land and the riverain marshes. Here they remain for a while, but by January or February water is again running short and the perennial grasses which flourish at this level have become wooden and unpalatable. There is no moisture left in the soil to produce a green regrowth. Then the herds must be moved to the river front. Large cattle camps are set up, there being considerable concentration as this kind of pasture land is often limited, and the people settle down for a while. They supplement their milk, meat and meagre supplies of grain with fish from the pools and lagoons. Then, when the rains begin to fall again, they hurry back to their villages to open the cultivations and prepare the ground for the next millet crop, leaving some of the younger men to follow later with the cattle. So the annual cycle begins again, a regular rhythm of seasonal activities dependent on the balanced utilization of the highland,[1] flood plain and the "intermediate" land which lies between. As a broad generalization this applies throughout the area, although some peoples are forced to move much farther than others.

In the upper reaches are the Bari and Mandari; people who are usually classified as Nilo-Hamites, but who have many points in common with their Nilotic neighbours farther north. Both these tribes rely on crop production more than on animal husbandry, but they have many cattle which must be grazed on the river front pastures during the dry season. North of them are the Nilotes. Of these, the Dinka are in the majority, though not all are directly dependent on the Nile system for summer pasture. Dinka tribes are scattered over a very wide area and are divided by the Nuer. During the nineteenth century the Nuer, who previously all lived west of the Bahr el Jebel, drove a wedge into Dinka country reaching the Ethiopian boundary in the east, seizing their cattle and land and absorbing huge numbers of Dinka into their own society. Until 1928 the Nuer were only loosely administered, but after a series of military operations known as the "Nuer Settlement," they settled down under a more systematic and progressive administrative system. They are now essentially friendly though still proud and independent of spirit but always with that engaging sense of humour which is common to all Nilotic peoples. The majority of these people are essentially pastoralists and are closely bound by the conditions already described. The Shilluk, the only other Nilotic people in this region, occupy a chain of

[1] The expression "highland" is, of course, relative. In this flat plain the differences in levels are at most a matter of two or three metres.

villages along the banks of the Nile. For centuries they have been the bastion against intrusions from farther north and, perhaps because of their greater concentration due to local physical conditions and the need for defence, they have a rather more advanced political system. This includes a "Divine King" as the symbol of national unity; a system which has many points of contrast to the acephalous and segmentary systems of the Nuer and Dinka. Like all Nilotics in the Sudan the Shilluk must utilize the river front pastures during the dry season, for at that time of the year there are no alternatives, but although they retain much of the outlook of the true pastoralist, they are more industrious cultivators and have less cattle than the others.

North of the Shilluk on the left bank and of the Dinka on the right bank are Baggara Arabs. The arabic word *baggara* simply means "cattle owner," as opposed to *gumala*, "camel owner" and there are many tribes inland as far west as French Equatorial Africa who are of the same stock and origin. The Baggara treat their cattle much as their forebears treated their camels. In fact they turned to cattle largely because, in this environment, where the rainfall is heavy, the soil slippery during the wet weather and biting insects numerous, the camel rarely survives for long. But the system of animal husbandry is rather different to that employed by the Nilotics. For one thing bulls are used as beasts of burden, an idea which is unknown and even repugnant to the Nilotic. Like the Nilotics, the Baggara are compelled to move with the seasons, but at the height of the rains they are able to drive their animals northwards into areas where the rainfall is lighter and the land undulating, much sandier and better drained. Nevertheless, later in the year they are compelled by lack of water supplies and the limitations of inland pasture to move their herds on to the riverain marshes which in this area are more extensive than ever before owing to the inundations of the Jebel Auliya Reservoir. Their stock seems to have increased accordingly and is an important item in the economy of the Sudan as a whole. We see therefore that throughout this whole region the riverain marshes, or *toiches* as they are called locally, are dependent on the fluctuation in river levels. They are of great importance and often indeed an absolute essential in the present pastoral economy of the inhabitants.

The effects on riverain pastures

Under present conditions, these *toiches* are drained of water when the river drops, leaving a very large area of green pasture after burning or cropping. It is usually only in this region that sufficient moisture is retained in the soil to permit a green regrowth, while in other areas the grass dries out, becomes wooden, unpalatable and lacking in nutritive values. In the Southern Zone, under the Project, the present seasons will be reversed, with the result that the riverain pastures will be flooded and inaccessible during the period when they are most needed at the height of the dry season between January and May. The effects in the Central Zone, though entirely different, may lead to a deterioration in existing pastures. The rivers will be permanently low so that there will be no spilling of water into the surrounding pastures, which at present causes what may be called a natural, albeit wasteful, system of

irrigation. Recent investigation has shown that the type, distribution and frequency of grasses are determined largely by the depth and time of immersion, though soil, humidity and temperature are important. Since these will be altered when spilling from the natural channels ceases, a change in the grasses may be expected. Vast areas of marshland or *toich* may become what we call intermediate land, where moisture sufficient to give a green regrowth in the dry period of the year only occurs in years of heavy and accumulated rainfall. It is difficult to predict what the exact changes will be and almost impossible to estimate with any great accuracy the extent of the reduction in existing riverain grazing.

In the Northern Zone, the seasonal variation in river levels which produces these naturally irrigated grasses on the riverain belt, will be much less than at present and there will be a consequent reduction in dry season grazing facilities. We therefore see that in some regions there will be a total loss of present riverain grazing and in others a substantial reduction. Unless adequate alternatives can be provided, there is bound to be overcrowding, over-grazing of what is left and finally a tremendous reduction in cattle. This is a matter of vital importance to the local population and also one of considerable interest to the country as a whole. Although the cattle trade is at present limited, it is potentially a valuable economic asset and one which may well be developed in the future.

It may be possible to control the discharges in the new river system in such a way that the effects already described are modified to approximate more closely to the natural variations of the present regime, and hence to reduce the losses. This is a question of careful management and control and is a matter which is receiving the close attention of the Jonglei Investigation Team. It may provide not only the solution where local interests are concerned, but also great potentialities of economic importance, especially in the Central Zone. Whether or not the losses can be substantially reduced by this method, there will still be losses to meet, and alternative pastures must be found.

Many people who visit the southern Sudan in the dry season are struck by the vast quantities of yellow dry grasses which, superficially, appear to be much the same as those which are used extensively for grazing in the north. The impression is misleading. The grasses in the south are mainly perennials which, under certain conditions, are unpalatable when mature and dry. Such conditions, which are sometimes referred to as "Sour Veldt," predominate south of the 640 mms. isohyet (approximately at Melut: lat. 10° 30′) where the rainfall exceeds 25 inches. It is true that these grasses will give a green regrowth which is of value as pasture so long as moisture is retained in the soil, but this rarely continues for more than a month or two after the rains are over and areas where regrowth continues throughout the year are limited. North of this point, "Sweet Veldt" is more common; that is the area where the grasses, mainly annuals, provide good grazing even when dry. Even here there are drawbacks. The quality and extent of "Sweet Veldt" depends on rainfall, and in years when this is poor the pasture is often sparse and rapidly consumed. These facts emphasize the need for riverain grazing which continues to support the herds even at the height of the dry season.

Nuer making a road bank

Dinka in the Aliab Valley

Dinka cattle camp near Bor

Baggara watering centre near Kosti

Remedies may be achieved by three main methods:

1. The provision of water points in places away from the riverain belt where grazing is available, but where water supplies dry out so that at present they cannot be exploited. This applies to "Sweet Veldt" pastures in the Northern Zone and elsewhere; in the "Sour Veldt," only to areas where natural conditions already produce a green regrowth of those grasses which would otherwise be dry and useless.
2. The provision of water points combined with the improvement of existing but unexploited pastures by various methods: *e.g.* by retaining moisture in the soil by such artificial means as banking, contour bunding or harnessing local watercourses in the "Sour Veldt," or increasing the growth of "Sweet Veldt" grasses by similar methods.
3. The provision of artificially irrigated grazing by pump or gravity from the river or canal.

Naturally, the first two forms of remedial measure are given the highest priority. But we are faced, not so much with priorities, as with possibilities.

In an area such as this where the annual rainfall is considerable, rain cultivation should always be possible. It is unwise however to assume that purely agricultural alternatives could provide the answer. There are at present many disadvantages. In most areas, the local distribution of rainfall is extremely variable. In some months there is so little rain that the crops are scorched and ruined, while in others heavy downpours and local rainfloods drown and wash them away. The peoples of this area of the Sudan are not energetic cultivators for these very reasons. The back-breaking processes of agriculture under such unpredictable conditions mean that only the minimum of grain is grown to meet normal needs, and even this is often not forthcoming. Hence, the people rely on animal husbandry, not only because the physical environment lends itself to this form of livelihood, but because the success of agriculture can never be guaranteed. By the introduction of more advanced agricultural techniques—drought or flood-resisting crops, better systems of drainage and rudimentary forms of irrigation, for example—agriculture could undoubtedly be improved.

At present there is no shortage of grazing in most areas, and with improved veterinary facilities including the provision of prophylactic drugs against the prevalent diseases in cattle, the potentialities in this sphere of economic activity are considerable. The area is at present well suited to the production of beef and beef products, both for subsistence economy and export. Apart from the inevitable difficulties of social maladjustment caused by too drastic and rapid a change from cattle-keeping to a purely agricultural existence, it might be unwise to remove so important an item, both actual and potential, in the Sudan's economy. In fact, it is impossible to generalize on these matters throughout the area. Local environmental conditions and the natural tendencies of the people under different circumstances vary considerably. It is probable that in most areas remedial measures will inevitably take the form of a combination of all methods. The emphasis will be on pastoral remedies in those places where economic development lies more obviously in animal

husbandry, and on agriculture in those where activities of this kind are likely to be more productive and beneficial.

Existing systems of agriculture are unlikely to be adversely affected by the Project except in places where islands and silt banks are used for cultivation. Some of these, especially in the Northern Zone, may be permanently inundated and no longer available for this purpose. Elsewhere, the opportunities for agricultural expansion may be improved, notably in the Central Zone where considerable expanses of rich papyrus land may be permanently exposed, although it would be unwise to be over-optimistic about the potentialities of developing this kind of land before experiments have been made. Both from the medical and veterinary point of view special difficulties may arise in the Southern and Northern Zones, since prolonged inundation may result in an increase in mosquitoes and disease-carrying biting flies.

Another local interest of great importance is that of fisheries. Fish is an important subsidiary item of diet for all these peoples and may well become more so, if fisheries are developed commercially. At present fishing is rather a seasonal and collective enterprise than a specialized trade, although there are elements of the population who live almost entirely on fish. Rudimentary methods of fishing are employed; mainly spearing fish in the shallows when the river drops. Such methods will be ineffective in areas where the river remains permanently high and waters run deep. Again, in the Central and Southern Zones where the river channels in the future will remain low even in the rainy season, the fish may be prevented from entering their inland breeding grounds in the swamps, many of which will no longer exist. It seems unlikely that there will be more than local changes and shiftings in the fish population. Remedies may well be found in the development of commercial fisheries in the best reaches of the river to provide for the consumer in others. The problem is a complex one about which all too little is known, but recent experiments in netting techniques and methods of curing have shown promising results.

We have so far only discussed matters which are the direct concern of the inhabitants of the riverain belt in the area south of Kosti who will be directly affected by physical changes. Others, living farther inland, are bound to be indirectly affected by the movements of those from nearer the river and by economic pressure, unless remedies to meet losses can be found. The total population directly affected, estimated on present taxpayer figures, which is a notoriously fallible method of census, is something between 700,000 and 800,000. This makes no allowances for population trends which may be towards a rapid increase. The total population, including those who will feel the repercussions, may well be nearer one or even one and a half millions. Since the Sudan, including both North and South, must be considered an economic unit, these matters are important to the country as a whole.

There are interests which may however be classified as general. In particular the problem of communications and navigation must be mentioned. The problem is a difficult one because the amount of water required for navigation purposes is sometimes incompatible with that required for other interests. In the reach of the river between Juba and Terakeka navigation is often difficult owing to the process of silting and the shifting of silt banks. A

minimum discharge of 50 m/d must be maintained if navigation by the normal shallow draft river steamers is to continue without periodic interruptions, unless some system of dredging or other expensive means of clearing the channel is employed. This discharge, and it is far from certain that this is sufficient, is in any case just about equal to what is proposed for the untimely season (57 m/d). As an alternative, it may be possible to move the river head port from Juba to Terakaka; a costly but not necessarily impracticable undertaking. Farther north and below Terakaka, there will be an improvement in present communications. The canal will provide a navigable and more direct route for river craft and also a good direct road along its banks. Navigation in the Bahr el Jebel itself may be difficult above Adok, but subsidiary services can be run to that point and overland communications from east to west will improve if the swampy areas are drained.

The problem of flood protection, already mentioned in connection with the working arrangements of the Project, is of vital importance. It is essential that the peoples of this region of the Sudan should be fully protected against the threat of floods. Even with the storage capacity reserved specifically for this purpose in the Albert Dam, if necessary supplemented by balancing reservoirs in the Nimule–Rejaf reach, the necessity to allow excess water to escape at a higher discharge than normal over a period of several years is bound to disturb local interests; especially in the Central Zone and Southern Zone. The minimum discharge estimated to be necessary under such circumstances would raise the river levels to such an extent that much of the land, in the meantime reclaimed and developed, would once more be inundated. This will not present serious difficulties provided that the canal is completed to full (55 m/d) capacity before such an escape of flood water is necessary. The completion of the canal to this capacity, before the reservoirs are in full operation, is therefore an essential proviso to acceptance of the Project in its proposed form.

We have seen that the maximum proposed timely discharge through canal and natural channels during the timely season is 85 m/d at Jonglei of which 55 m/d will go through the canal and 30 m/d through the river. This is sometimes referred to as the "55 m/d Canal Stage." As a logical development of the Project, it has been suggested that this total timely discharge may one day be increased from 85 m/d to 110 m/d, of which the canal will take 80 m/d. This is known as the "80 m/d canal stage" and will be required only when the whole plan for control of the Nile system is complete and includes "virtual storage." It is not necessary to consider here the reasons for this proposal in detail, though it must be mentioned that the implications for the Southern Sudan are serious. Under this extension of the Project, the extent of the changes in the river regime would be greatly increased and the adverse effects on local interests aggravated. In the Northern Zone in particular there would be practically no seasonal variation in river levels with the result that instead of a 20–30 per cent. loss of riverain grazing predicted under the "55 m/d canal stage," 90 per cent. or even 100 per cent. of the present river front pastures would be permanently under water and no longer accessible.

An outline of the Equatorial Nile Project, a few of the important facts in connection with its control works and something of the difficulties which

will result, have been given above. Naturally the whole problem is highly complex and generalizations on physical and human problems over some 1000 miles of river are not only unwise, but usually inapplicable. It is sufficient to conclude this short description by saying that the Sudan Government has, on the basis of the facts revealed by the Jonglei Investigation Team up to 1948, informed the Egyptian Government that there is no fundamental objection to the Equatorial Nile Project, provided that vital interests can be safeguarded and acceptable alternatives can be found and supplied when losses occur. The reader will now appreciate that these provisos involve a full programme of investigation and research.

Such a programme which is undertaken by the Jonglei Investigation Team, even if the aim is to provide only general indications, approximate rather than exact answers, is by no means easy, especially in a short period of time. Hydrological data on the main channels of the Nile System are considerable because the Egyptian Irrigation Department has kept careful records during the past fifty years or so. Of the multitude of minor watercourses and inland drainage channels, of the vast swamps and basins, of the effects of rainfall combined with poor drainage; little on the other hand is known. The problems are however by no means confined to the main river channels nor to hydrological matters alone. In other spheres, grassland research, agriculture, fisheries and other subjects, the information is not less scanty. It is not possible to describe here the difficulties which the Jonglei Investigation Team has itself to face in so vast and varied an area. The photographs which accompany this article will give some idea of the variety of the country and its inhabitants, and the purely physical difficulties to be overcome in obtaining the necessary information by survey and experiment.

However, the Project will be carried out in slow stages, and the final effects will not be felt for many years after the work has begun. For this reason it may be possible to meet the demands of each stage as each stage is reached. The Project as a whole, properly managed and designed to suit the interests of all inhabitants of the Nile Valley, as any project for river control should be, opens up great possibilities for economic and social development in the Southern Sudan. These possibilities may outweigh any disadvantages of the kind we have already described. Mismanaged, it might prove disastrous to the people of this area. Either way it will be a tremendous task to lead these people to a new way of life. It is a task which will demand patience and understanding, ingenuity and careful planning, supported by the very best technical advice.

MORE ABOUT THE KALAHARI

E. J. WAYLAND

THE KALAHARI is not an easy place to know. It is still less easy to understand. Rapid journeys through that wilderness seem to engender views regarding its aspects and hypotheses concerning its history that closer and more protracted studies fail to support. Certainly, nine years of close acquaintance with the Kalahari and much work in it, have so fashioned my conclusions that I find myself unable to agree with all that Professor Debenham has so interestingly chronicled in the March 1952 number of this *Journal*. Indeed, several of his disclosures discord strongly with my personal knowledge of the thirstland, and with that of other competent and long resident observers in the country. Reluctant as I am to do so, I feel bound to call attention to some of these statements which, if allowed to stand, will almost certainly lead to much unfortunate misapprehension.

Professor Debenham writes of the Kalahari that "almost everywhere there is a surface covering of fine yellowish calcareous sand from 5 to 500 feet in thickness . . . distributed just as it is in a true desert in ridges and dunes." One can hardly recognize the Kalahari in this description. Du Toit writes of it as follows: "an almost uninterrupted mantle of transported red to grey sands resting on a peneplained surface." [1] Although surface discolouration in many places disguises the fact, the Kalahari sand is characteristically red, but because this statement may seem to involve a matter of discrimination, it leads to the question which I shall shelve for the moment, of "What do you mean by Kalahari sand?" Let us for the moment discuss the sands of the Kalahari. These are of several colours but red is quite the most predominant. Yellow and yellowish sands, to nearly white and white certainly occur but these are reblown or bleached red sand.[2]

There is, too, an important deposit which covers very wide areas of flat country. It is dark brown and powdery when dry, but it generally appears grey at surface, in consequence of the sluicing action of rain which removes the more easily transported fractions and leaves most of the tiny polished sand grains with which the deposit is packed. When wet, the material is very nearly black, and slippery.

A number of dunes, particularly in the south-west of the Protectorate, are built of reblown and therefore yellowish sand. They yield an interesting microlithic culture, with ostrich egg shell beads. Much of this sand is on the move again, and is producing dune patterns which almost defy description. In the neighbourhood of the Nosob-Molopo confluence one sees wire fences with wide gaps below them in places, so that one can walk under the wire. In

[1] Geology of South Africa," second edition, 1939.

[2] The red sand is coloured because each grain has a coating (pellicule) of ferric oxide. There are two ways by which that may be partly or completely lost: one is by reduction and removal of the oxide (a usual consequence of plant decomposition in the presence of considerable moisture), the other is by attrition during a reblowing.

other places a fence is submerged in sand. This shifting is however not widely true of the sands of the Kalahari in Bechuanaland to-day; but as Debenham points out, the morphology of the Kalahari is still that of a desert. The thickness of the sand is of course greatest under the tops of the dunes, except where low rocky hills have banked it back, as for example, in the country about 70 miles west of the Okovango swamps, in Ngamiland; but generally speaking the sands are comparatively shallow. Over very wide duneless areas they are hardly more and often less than 10 feet deep. There are some places where they are however considerably thicker than this; but anywhere in Bechuanaland 100 feet must be regarded as very thick indeed, and 500 feet seems quite out of the question; except where, with other materials, they have filled in ancient depressions, some of which appear to be rift valleys. There appears to be a tendency among travellers to overestimate the thickness of the thirstland sands.

Speaking of the Kalahari in general (not only of Bechuanaland) Du Toit says "A thickness of 40 to 50 feet of sand is common while 200 feet is exceeded in the Gwaai Reserve, but over most of the region the depth is unknown." (*loc. cit.*). It is probable that the sands thicken in a westerly direction towards South-west Africa, as they do in Rhodesia. Special studies of the sands of the Kalahari are being made by the Geological Survey of the Bechuanaland Protectorate. These investigations have already extended over a period of years. The laboratory work was entrusted to the now Professor of Petrology in Columbia University, Dr. A. Poldervaart, and to A. Rúddock of Rhodes University. The former has dealt with more than one hundred samples from various parts of the Protectorate; sieved them to five fractions; determined the total heavy residues, in the finest fractions, of each, counted the non-opaque heavy minerals in the finest fractions; measured the size of certain non-opaque heavy grains and generally studied the mineralogy of the sands. A. Ruddock, who is still continuing his sand work, under Professor Mountain, has undertaken further investigations and will be responsible for the final publication. O. J. van Straten, acting chemist and petrologist to this Survey, has done work on some of the calcretes and silcretes and on some of the sands. He will doubtless do more. I have undertaken the stratigraphy.

Between and including the years 1943 and 1946, when I was geologist to the Water Development Survey, I collected very large numbers of sand samples from nearly all over the Protectorate, but while I myself was on overseas leave, and the Government Surveyor was away on cadastral work, an invasion of termites played havoc with bags and labels and rendered the collection useless.

Contrary to what Professor Debenham has told us, it can be confidently stated that present sands of the Kalahari are markedly non-calcareous, which indeed they should be if his statement that "rain of the ages past has leached the upper layers and cemented the lower layers to produce two kinds of rocks, which we may describe as useful calcrete and useless silcrete" could be substantiated. The sands are very widely underlain and separated from the bedrock by sheets, often thick, of calcrete or silcrete, and these substances theoretically would be expected to grade one into the other, as Debenham and others have no doubt rightly said they do. But those rocks are for the

most part quite distinct, and everywhere the latter appears to be a silicious replacement of the former, as Passarge was the first to point out ('Die Kalahari,' 1904). But the calcium carbonate of the calcrete and the silica of the silcrete could not have had the source that Debenham claims for them, for not only is there a very definite interface between the sands and the underlying calcrete and silcrete, but wherever I have seen that interface, it is provided by an eroded surface. Upon this, stone tools are to be found in a number of widely separated areas. The eroded surfaces and the tools that rest upon them form a part of the evidence which beyond doubt shows that man inhabited this country before the Kalahari desert; or more correctly, before that expression of it that was the precursor of the present thirstland dispossessed him. It therefore cannot be claimed that "calcrete and silcrete are products and not agents of the former desert."

As Debenham points out, the calcrete has holes and cracks in it, but these are mostly near the surface. In some cases they are filled in by secondary deposits, while thick beds of calcrete are dense in numerous places (but not everywhere), and underlie the more pervious material. It must however be admitted that these dense calcretes tend to become somewhat friable in depth. Silcretes vary very considerably. Many are for all practical purposes quite impervious; others will permit the passage of water through cracks. An interesting case of replacement may be seen near Maun where the top few inches (up to about 1 foot) of a massive calcrete had been replaced by opaline silica (there is usually a good deal of opal in silcrete). This replaced one-time surface is buried beneath another and somewhat slabby deposit of calcrete. Double calcretes, slabby above and massive below, are not uncommon. Cases are known where a silcrete is overlain by a calcrete; the interface being an eroded surface carrying stone tools (below the floor of Sekhawane pan, about 20 miles south-west of Kanye, for example).

Not only do calcrete and silcrete pre-date the sands that lie above them, but there are calcretes and silcretes of different and distinctive ages, as the study of them in relation to prehistoric cultures shows. This fact should solve Professor Debenham's puzzle regarding the distribution of calcrete outcrops. A concretionary form of silcrete is apparently forming in some pans to-day, just as nodular calcrete is forming in some soils; but optimum conditions for the production of these substances do not exist at the present time. They occurred in the past, and they may well return in the geologically not far distant future. Recent field studies have produced nothing to militate against Passarge's view that calcretes generally form during semi-arid periods when, in response to the dictates of climate and topography, alkalies accumulate in the soil; silcretes being produced when silica dissolves in alkaline solutions which come into existence during succeeding wetter periods.

In these circumstances, sands can be cemented into calcrete and later altered to silcrete. Indeed this has taken place in the Kalahari during days prior to the deposition of the present sands; but there is evidence to show that the replacing silica was not derived from these old sands, and there is nothing positive to indicate that the calcium carbonate of the calcretes came therefrom. But it might have done so, for by no means could it everywhere have been derived from the underlying rocks. Some calcretes have been

deposited in water, seemingly at a distance from their place of origin, for they contain lascustrine shells and locally they pass into diatomite beds.

Professor Debenham is right when he declares that the true agents of desert reclamations are plants which depend for their existence upon a rainfall in excess of that which obtained in desert days; but one has to draw swords with him again when he states that humus derived from plants provides acids for cementing the grains of sand into immovable masses. Were these acids in fact cementing rather than disrupting in their action, the Kalahari should by now have a vast immovable crust, but there seems to be no trace of it, nor of any such immovable masses. With regard to rainfall, Professor Debenham speaks of an average of 27 inches in the north and remarks that it is "a very good rainfall indeed." But is it? In Bechuanaland rainfall tends to be so erratic that an average over the few years during which measurements have been taken has very little significance. Annual rainfall in any one place tends to vary extremely widely, and it is the nature of the rainfall, rather than its amount, that matters most in plant adaptation, and therefore in plant morphology. It has been pointed out by several writers that the rainfall over much of the Kalahari is greater than one would expect. It therefore seems significant that the Kalahari vegetation is adapted to withstand droughts rather than to absorb rain, and that droughts do not destroy it.

At first the rain begins very rapidly to soak into the ground, but as the water penetrates progressively lower the percolation rate decreases astonishingly. Meanwhile sheet run-off starts, and provides a most remarkable sight. Once it starts practically all the flow is lateral. There is hardly any downward percolation. This unilateral movement is strikingly illustrated by the ephemeral rivers of the eastern Bechuanaland Protectorate. During torrential downpours, the water-level in wells dug into sand considerably above the levels of the dry river bottoms, or headed up above them, does not begin to rise before the country is flooded (provided no water pours down them). Even then the well water-level remains about stationary until the flood begins to subside. It may be said that laterally and strongly flowing storm water generally tends to keep its direction and does not penetrate downwards, except to a very limited extent. But on the other hand, stationary and slowly flowing water goes down, if it possibly can.

Beneath the disturbed and discoloured surface material the virgin red sand of the Kalahari (the Kalahari Sand proper, to be defined later) has some of the physical properties of a loam. Like the limon of Belgium and the loess of China it stands vertical in a cutting or in a gully bank. Very rarely it displays a suggestion of columnar jointing, incipient until the sand collapses. Between the grains of the red sand, finely divided material is packed, apparently derived by decomposition of chemically unstable constituents during wetter times that succeeded the true desert days, and dehydrated when aridity returned. Any remaining openings, although they may be many, are minute and air-filled. Consequently there is a gradual piling up of descending moisture against increasing resistance until percolation practically stops, and a moist zone (the equivalent of the "sip-layer" of reblown sands? [1]) situated

[1] See p. 18, bottom paragraph, of Professor Debenham's paper. The Bushmen also make artificial sip-layers. In flat ground at the base of a dune and preferably between

a few feet below the surface results; or so it would seem by the behaviour of roots that run horizontally instead of probing deeper.

Dried samples of the red sand show, like the world famous Mansfield sand of Nottinghamshire (part of the one-time British Kalahari) a remarkable power of absorption. A lump of it will suck up water as a cube of loaf sugar will soak up tea against the pull of gravity. But for a bedded deposit to absorb liquid is one thing: for it to yield that liquid to a well is quite another. Measurements made by Mr. van Straten, in the Geological Survey Laboratory at Lobatsi, revealed the porosity per cent. of volume of two red sand samples to be about 25. This may be regarded as decidedly low for sand, for according to Peele (of those very reliable reference volumes [1]) the usual porosity of sand of variable grain is 35, the limiting values being 26–47. The usual value for sand of uniform grain size is given as 38, with limiting values of 35–40, while the porosity of dune sand is stated, significantly enough, to be 24 (no limiting values quoted).

Plants, of course, extract moisture by means of hair roots, but what with plant transpiration, depth resistance, astonishing capillarity, low porosity and evaporation doubtless much higher (measured in inches a year) than the rainfall, the red sand has little chance of providing drinking water for man and beast. It is this physical constitution of the red sand that has prevented the Kalahari from becoming, in these days, a gigantic swamp. So complete was and is this prevention that it is by no means unusual for the water-table, where it exists, to lie at a depth of several hundred feet below the bottom of the Kalahari sand in Bechuanaland.

In reblown sands the sip-layer, the zone from which the Bushmen suck water through hollow reeds pushed into it, is definite and distinctly moist to the touch, although the sand above and below it feels bone dry. In the extreme south-west of the Protectorate I have made use of the sip-layer for the purpose of ascending reblown but stationary sand dunes with a lorry. This is a very slow process, for one advances a few feet only at a time. The procedure is to dig shallow trenches in front of the wheels down to the sip-layer, remove enough sand between the trenches to prevent friction on the under part of the chassis, and to run the lorry upon the sip-layer surface.

Some Karakal sheep farmers told me that there had not been any useful rain in that area for two years, but the sip-layer was still there; a fact which serves to emphasize another: that is the well-known absence of capillary action in ordinary sand; and the reblown red sand of the light-coloured dunes is ordinary sand. It is not loam-like. Here it is fitting to refer to the story told to Professor Debenham of the amazing performance of the old Bushman woman, who is said to have kept alive one man and his companion, four donkeys and herself by sucking water from the desert sand for a fortnight. The other two humans dug a well 30 feet deep and established "the flourishing little settlement of Kakia."

two dunes, they dig out the sand to a depth of 2 or 3 feet and half fill the excavation with dry grass; the excavated sand is then put back. They can suck water from this type of sip reservoir for long after the rains have stopped.

[1] 'Mining Engineers' Handbook, 1939.

Times have changed, and conditions with them. Water is no longer so easy to obtain at Kakia, and boreholes are successful only in so far as they are sited with due regard to geological setting. To-day the water, thus located, stands at about 150 feet below ground surface. This is not deep for Bechuanaland. With this sip story must be bracketed the no less astounding tale (convincingly indicative of the sanity of rationing) of the gastronomic miracle accomplished by the little 100-lb. Bushman who is said to have devoured 58 lb. of meat in one day! Monuments have been erected in the memory of men for lesser achievements than this.

From the above it will be easily realized that the prospects of finding water in the sands of the Kalahari in the Protectorate are remote (although exceptional cases must almost certainly exist), and Debenham's proposal to scatter water points by having many wells rather than a few deep boreholes, though theoretically sound, was doomed to failure. This I pointed out to the Colonial Development Corporation in February 1951. And so it has proved. It might however be admitted that a very natural preconception, unchecked by close investigation, would lead almost anyone to regard the Kalahari as a huge sponge ready to soak up nearly all of the not inconsiderable rainfall that descends upon it. But according to some experiments I started in 1944, the sand absorbs very little rain except at and near its surface where vegetation, burrowing insects and mammals, wind, fires and other disturbing influences have loosened it.

Rightly or wrongly, one gets the impression that the desert is returning to its own, and in my opinion this impression is no mere idle one. The rains that fixed the dunes (they have been fixed and unfixed more than once) were superimpositions upon a long-lasting desert regime, and it is significant that the most marked of these wetter periods occurred in Pleistocene times; moreover, they were sufficient to promote perennial rivers, the now dry boulder gravels of which are rich in Stone Age relics.

I would now like to refer to pans. In this part of the world any low-lying ground that interrupts the general level of the plain and naturally carries water for a month or two after the rains is called a pan. But there are pans and pans, and those of the greatest interest are clearly of aeolian origin. Some at least of the others are *vleis*, which because they are remains of old river beds, show some alignment. But the more important ones and by far the most numerous, are the aeolian pans. There appears to be nothing to show that they are forming to-day, nor that elephants had a hand (or feet) in their production. There can be but little doubt that they, like the thick beds of calcrete and silcrete, are a consequence of past conditions which were optima for the production of these substances.

Nearly all the wind-made pans are large or very large, and they have embracing dunes of sand blown from the pan sites to their south and south-east sides. They tend to be circular in plan and very flat-bottomed, and this is a matter of importance to hopeful searchers for "the lost city of the Kalahari," as except for those with stoney outcrops or scattered rocks, the large pans provide excellent landing grounds for aircraft. Many pans yield water from or beneath the calcrete blanket, thinned by corrosion and deflation. From not a few pan bottoms this blanket has been more or less

completely removed; nonetheless most of them yield water to hand-dug wells, provided these are deep enough.

Most pans contain deposits which are sufficiently impervious to support water (always shallow) for a month or two after the summer rains; the absence of such deposits, far from being disastrous, would in my opinion be beneficial in sending water below surface to reinforce the ground-water supplies which, one is credibly informed, are almost everywhere sinking. It would appear that the water-table loses altitude in all directions away from a pan. The aeolian pans tend to run in belts within which alignment is more often apparent than real, for tracks (so-called roads) are taken from pan to pan. (One is reminded of Mark Twain's thesis "On the tendency of large rivers to flow by large towns.") The whiteness of a pan is no criterion of its saltness. White calcretes and silcretes of the bedded type are characteristically exposed in pans, and their detritus is white. White concretionary silcrete, bleached sands and diatomites also occur. White granular, crystalline salts sometimes occur in sandy deposits beneath the surface of a pan, as at Tsane for example, while bedded salt probably exists below the ground in the north-eastern part of the Makarikari, for reasons which follow.

Near where the generally dry Shua river enters this so-called pan, salt springs appear when the water-table is high after rains and, as I pointed out in 1943, the existence of certain corroded pebble-like stones on the pan surface, more or less in the same vicinity, may be similarly indicative.

The pebble-like stones are neither waterworn nor, below certain maximum dimensions (about those of a large walnut), are they sorted by size. They bear no observable relationship to any influent or affluent channels, nor to any true gravels. They display dull white lumpy and corroded surfaces and, when split, are found to be composed of vein quartz. Whence did they come? They were not brought there by stream action; they cannot have dropped from the clouds, nor are they a variety of silcrete or sinter formed at surface. They must therefore have come from below, having been displaced and pinched up, likely enough, by something crystallizing underground; just as stones and artifacts are gradually shoved to surface by swelling activities engendered in the containing black cotton soil (so-called) during rains after drought.[1]

The corroded surfaces of the pebble-like stones we are considering suggest most strongly the work of alkalies, and therefore the presence of salts. The Makarikari is a dwindled great lake which was the centre of an internal drainage system in desert days. What more likely, then, than that the hypothesized salts are bedded evaporites? A characteristic feature of the pans is the lack of vegetation on their floors. This is however not true of so-called pans which

[1] In 1920 I discovered a primitive Stone Age culture or industry in Karamoja—the semi-arid country in the north-east of Uganda. The artifacts were made from bits of vein quartz which were weathered out and ruptured before the overlying "black cotton soil" was lain down. Through this material the artifacts, and associated unworked stones have surfaced, and have thus produced a highly characteristic rubble skim. (Some of the artifacts are of course post-rise in age). A similar skim is to be found in parts of the Tati Concession area of the Bechuanaland Protectorate, and I have no doubt, in numerous other places in Africa where geology and climate have been conducive to its formation.

were one-time lakes, nor of vleis, nor of what may be called dead pans, the floors of which support a soil mantle. Moreover, fine sands and dust deposits may be blown into a pan, thus covering a part of its floor. These commonly have a vegetal cover of grass and scrub; but I know of no pan capable of supporting one thousand springbok to the square mile.

I have drawn a distinction between the sands of the Kalahari and the Kalahari Sand. The former include the latter. They are of several distinct ages, and the most important among them is the Kalahari Sand, as I define it. This is the red desert sand that generally goes by that name in Bechuanaland. Its extremely wide extension is well known, but in former times it covered an even vaster area than it does at present. Its accumulation brought to an end the halcyon days in which man in Africa evolved the Chelles-Acheul type of culture. But beyond the borders of the Kalahari desert men survived and went about their various occasions, doubtless sometimes visiting the less forbidding portions of this ocean of sand.

The long protracted duration of the desert was not unending, and when the wheel of change had turned full circle Stone Age man, now at the upper Sangoan-Levalloisean stage in his advancement, returned to the Kalahari in the wake of the game which followed the spreading vegetation that was to cover the country and anchor the dunes. The times of ample summer rains had come again. The desert period represented by the Kalahari Sand occupied the time that elapsed between the second and third pluvials (the Great Interpluvial) and so deserves a distinctive period and stratigraphical name. Hence the capital S. Clearly it should be the "Kalaharian."

I have for years recognized remains of both older and younger sand blowings in the Kalahari region: but the consideration of them is part of a subject far too big to be adequately dealt with in these pages. However it is briefly introduced to emphasize the intense interest of the Kalahari and its history, the study of which is indispensable to the proper understanding of its present economy.

THE LAND'S END PENINSULA: THE INFLUENCE OF HISTORY ON AGRICULTURE

NORMAN HILTON

THE NECESSITY to produce more food from our own soil demands that we examine, amongst other problems, the possibilities of agricultural development on our moorland fringes. One such area, which has recently been investigated, and where public and private investment might result in increased food production, is the Land's End Peninsula of Cornwall. Here, over an area of about 55,000 acres west of a line joining Penzance and St. Ives, is some of the finest early vegetable and flower land in the country, some very good dairying land, and moorland which is as bleak and depressing as any in Britain. In many parts of highland Britain, between the regularly cultivated land of the valleys and the rough grazings of the upper slopes, there are narrow belts of enclosed rough grazings which have been cultivated from time to time whenever market prices made the effort worthwhile. But here in the western tip of Cornwall, a casual observer is struck by the great number of enclosed rough grazings and by the irregular manner in which they are found amongst improved pastures. The dyke-like stone "hedges" represent a great deal of time and effort, and one inevitably asks if this land was not put to better use in the past. Yet these uplands which are windswept and damp, almost completely lacking in trees, and scattered with declining, depressed settlements do not appear conducive to agriculture, in contrast to the lower slopes and coastal pockets. Many visitors therefore are apt to consider existing dissimilarities in agricultural values as inevitable and due to basic physical differences.

Early in 1952 the Research Group of the Agricultural Land Service of the Ministry of Agriculture and Fisheries began a general investigation into the possibilities of developing this virtual wasteland. A preliminary study of physical conditions in the peninsula was essential to avoid wasted effort, should basic influences, such as soil and climate, preclude agricultural development. If however these did not prove to be insuperable obstacles, it would be reasonable to ask why certain areas were lying idle whilst neighbouring fields were being intensively stocked with dairy herds, or producing valuable crops of early vegetables and flowers. An answer, it was thought, might be found in the long history of the district.

The Land's End Peninsula is essentially a granite mass rising from the sea, with small areas of old Palaeozoic rocks and a little alluvium on its south-eastern fringe around the town of Penzance. Its maritime climate notably lacks extremes of any kind. Annual and diurnal temperature ranges are slight throughout the peninsula, though a little greater on the uplands than at Penzance and its immediate neighbourhood. Rainfall occurs all year round with a maximum in winter, total precipitation increasing on the uplands. Strong and persistent winds somewhat offset the general mildness of the

climate, but again these are more serious on the uplands. Granite weathers considerably under local climatic conditions, giving fairly deep soils in the main, though variations in depth occur due to the layered formation of the granite mass. The potash content is satisfactory, but the soils are leached of lime and phosphate by the heavy rains, as also are the soils produced on the Palaeozoics near Penzance, which are rather looser than the granite soils and support better crops of grain and grass, provided there is no drought. Where these latter are mixed with alluvium a closer, moisture-retaining soil is found, which retains warmth and is generally more satisfactory.

These physical conditions sufficiently explain certain features of the agricultural geography. It is the area around Penzance which has the advantages, slight though these are, in soil, rainfall, temperature and shelter from wind; and these allow it to meet the somewhat exacting demands of specialized vegetable and flower cultivation, provided lime and other fertilizers are applied in quantity. These are found close at hand as calcareous sea-sand and pilchard compost. Physical conditions elsewhere however are so nearly uniform that similar land quality, similar land use and similar husbandry might reasonably be expected. Yet this is not so. The Land Utilization Survey of Great Britain (1933) distinguished a broad belt of medium quality land (Class 5), used for mixed farming with a strong emphasis on dairying, which included most of the land up to about 450 feet. Above this altitude the land was classed as 9 (*i.e.* medium quality land interspersed amongst the poor quality land of the moors). There winds are perhaps a little more serious and temperatures are a shade lower, but the main difference between this land and that at the lower levels is the prevalence of rock on and just below the surface. Where the granite is finer grained the surface is less boulder-strewn, but such areas are found in both generalized land classification zones, and the boundary between the two, although corresponding to a marked line of change in level, does not appear to be significant of any physical characteristics directly influencing the type of agriculture practised to-day. It seems therefore that the lack of agricultural development on much of this land in Western Cornwall cannot be attributed to any lack of inherent fertility.

This paper is the essence of a report prepared to explain the underdeveloped state of the area, and to aid the assessment of reclamation possibilities by determining the areas which have been productive in the past. It is written chronologically illustrating new influences as they became important, and it shows how certain factors recurred again and again, thus forming a remarkably consistent theme for two and a half millenia.

The establishment of the "Celtic" tradition

In no long-settled country can the existing agricultural set-up be completely divorced from the past, and here in Western Cornwall what is essentially a unique agricultural picture to a large extent reflects not only an ancient agricultural system, but also a complete economy rooted in prehistory. Since the visits of the Phoenician traders, this has been a mining area; archaeologists believe that mining and agriculture have been practised hand in hand since these early days, and until the middle nineteenth century

A.D. there existed a complex dual economy in which mining, despite fluctuations, gradually came to overshadow agriculture in the eyes of successive observers. For centuries agriculture was neglected, and as the area was remote from the eastern source of agricultural improvements, there was a remarkable continuity in farming technique and land use which is still apparent to-day. Without being wholly unsatisfactory local husbandry was, and still is, in many ways foreign to that of the rest of England. Its long leys, its small enclosures and solid, dyke-like walls, and its fluctuating margin of cultivation are all part of a theme which has undergone its variations, but which has remained clear and on the whole distinctive.

The system of making small irregular enclosures from the waste by removing stones and boulders, and building them into sturdy walls around an earth core, is generally known as the "Celtic" system; but it was known here before the coming of the true Celts. With the enclosures went a system of mixed farming, utilizing a regularly cultivated and well-manured "in-field" and an "out-field," perhaps only temporarily enclosed, which was occasionally tilled but then allowed to revert to waste. This was wasteful and inefficient "shifting agriculture," but in a sparsely populated land it was reasonably satisfactory, and in Cornwall the livelihood so gained was supplemented by the mining of tin. The earliest settlements were made on defendable hill-top sites and the oldest enclosures were immediately below. Many of these can be dated to the late Bronze Age, and around them "lynchets" show the plough to have been used far above the existing line of regular cultivation. Long before the Roman period, therefore, a landscape of small enclosures surrounded by vast areas of moorland was to be seen. Gradually the enclosures spread down the slopes as population slowly increased, and the "Celtic" field system then established was unaltered by what little Roman penetration was effected. Later the area was re-peopled from Ireland, but these were Celts, and the field system and husbandry remained unchanged.

The first changes came about in the sixth century A.D. when the tribal kingdoms were occupying territories approximating to present day hundreds, whose boundaries follow the lines of least population. The hill-top settlements had probably by then been deserted for the lower slopes, and the areas south of the watershed seem to have been more closely settled at the expense of the more exposed northern slopes. The Saxon system never disturbed this area, and Norman changes in the social order were somewhat superficially attached to an established pattern. New enclosures were made when necessary; those with longer and straighter sides are probably medieval in origin, but undoubtedly in the old tradition. At Domesday there was nothing in the area which resembled the common conception of a medieval manor. The nine which were recorded were small and had a marked deficiency in ploughteams for the recorded ploughlands, a characteristic which almost certainly indicates intermittent cultivation on the edge of the arable land proper. The place-names were undoubtedly those of a pastoral society, but livestock were very few in relation to area, transhumance accounting for the widespread occurrence of such names. Population too was scanty, and the settlement pattern must have been one of small isolated hamlets surrounded by few cultivated fields in the midst of occasionally used moors.

This pattern is best explained by the agricultural set-up, and its importance can hardly be overestimated. It precluded the nucleated community with its open-field system which, though it defied progress for centuries, at least kept the peasants in touch with the landowners who ultimately set the example in improvement. Here in the Land's End Peninsula the small farms were remote, in space and thought, from the progressive landowners of East

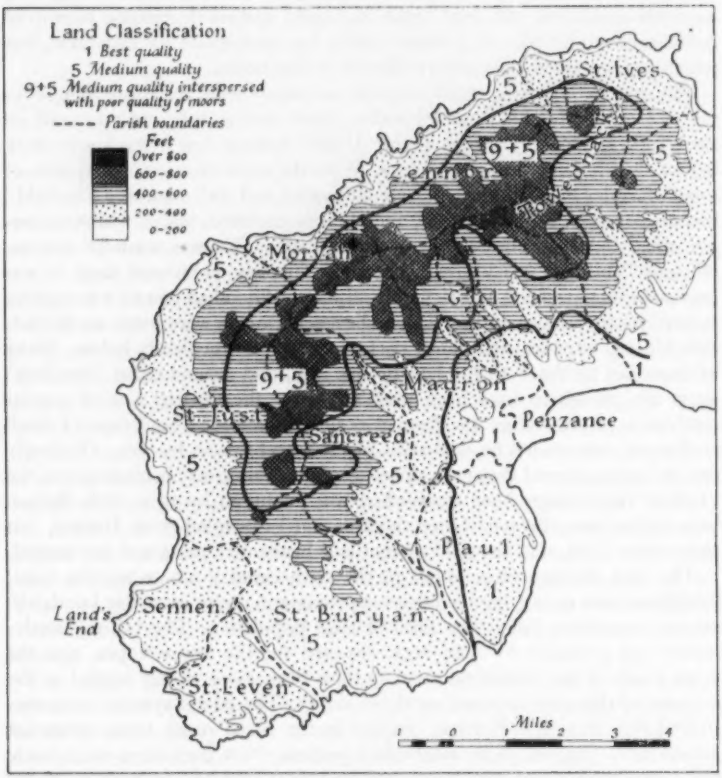


Figure 1

Cornwall, and were notoriously slow in following their example. The backwardness in the centuries which followed Domesday was in no small measure due to a settlement pattern and social economic organization which was well established by 1086.

Development within a dual economy

From Domesday until the late eighteenth century the "Celtic" tradition, essentially extensive and conservative, worked hand in hand with an over-

whelming local concentration on tin mining, to produce a backward agriculture and a wasteful, primitive type of land use. In the early middle ages, tin-mining and wool-growing were the backbone of the Cornish economy, and this area shared in both, but the "Cornish Hair" was of notoriously low quality, and in this peninsula sheep rearing seems to have been confined to the fairly well sheltered parts of Madron and St. Buryan. Its effect on future

Figure 2

agricultural development must have been quite negligible, it could never have supported a large population, and there is no evidence whatsoever of enclosures being made specially for sheep. Far more important was the growth of the mining industry which, widespread in the early days, gradually concentrated in the northern half of the peninsula, but continued to affect agriculture and land use over the whole area. Until about 1275 the industry expanded, but then a decline set in which speeded up in late Tudor times, and eventually operations stopped completely during the Civil War period.

Then, on recommencement, the industry began to flourish and continued to do so throughout the eighteenth century—mainly to the detriment of agriculture, which could offer nothing comparable to the prospect of sudden wealth and the legal privileges which went with mining activity. Yet agriculture benefited to some extent from this lucrative industry, for mining supported a population which was the densest in all rural England; and this was of great importance, considering the remoteness of the area, to those farms in the southern half of the peninsula which found their markets with the mining population. Further, there can be no doubt that large areas of waste were first cultivated by miners who invariably created smallholdings around their cottages and workings. Despite this however it is evident from contemporary documents that agriculture was neglected when mining flourished, and that serious advances into the waste were made only in periods of mining depression. It is with this in mind that we must consider the spread of enclosure.

At Domesday the landscape was one of isolated patches of improved land amidst the unimproved moors. From place-name evidence we can trace the spread of new enclosures, and Figure 2 shows the areas which appear to have been broken in between the years 1100 and 1485. This map is probably incomplete, but it clearly illustrates the piecemeal nature of the movement and the absence of any predominant direction of advance into the waste. Nevertheless, except in the immediate vicinity of the mines at St. Just, Morvah, Towednack and Northern Madron, the enclosures were almost entirely confined to the southern half of the area, and this picture remained fundamentally unchanged for the first seven or eight decades of the sixteenth century, according to the most reliable of Tudor observers. Dressed with sea-sand and pilchard compost, these enclosures were productive and mainly used for wheat, rye and barley, though a wide range of other crops were grown, and livestock were regularly grazed in the enclosures when corn was not planted. The more distant fields were more casually cultivated, "pillez" (a type of oat known in fourteenth-century England as "Pilcorn") being grown as a last crop before the land was allowed to revert to waste. Transhumance was still practised and livestock was plentiful, though of poor quality even at a much later date. Early Tudor agriculture in Cornwall, by no means unsuited to its environment where it was practised best, was admitted by all contemporaries to be in a sorry state wherever mining was at all profitable, and despite a fair degree of agricultural efficiency in certain localities, the peninsula as a whole had to import food at high cost.

With the rapid decline of the mining industry during Elizabeth's reign came not only a relative but a very real change in the attitude towards agriculture. People could no longer afford to buy imported food, made expensive through difficult transport conditions, and were forced to feed themselves from their own land. A phase of agricultural development followed which was, by Cornish standards, almost revolutionary. The more careful methods of cultivation of the coastal areas were applied to new and old enclosures both in the south and in the mining districts of St. Just and Zennor where redundant miners were being forced to subsist by their own husbandry on land whose fertility had previously been underestimated. Enclosures were

definitely made for tillage but served also as protection for livestock, which by their presence both improved the pastures and built up fertility for future grain crops. These trends continued until mining revived after the Civil War; nibbling at the waste continued unorganized and unrecorded; and the "out-fields" were sufficiently intensively cultivated for the area to dispense with imported grain. Then, as mining began to flourish once more, the "Cornish agricultural revolution" died in its early childhood. The "in-fields" were cultivated in the traditional manner which seemed quite satisfactory, but the "out-fields" reverted to furze. Shifting agriculture was still common in Cornwall, and remained so through the seventeenth and eighteenth centuries.

Towards the end of this period the eastern part of the Duchy was progressing quite rapidly, but the western peninsula, dominated economically by mining, remained "Celtic" and a distinctive regional entity. With mining activity more localized, some variation within the peninsula must have become apparent, but the advances of the agricultural revolution by-passed the area, and it fell further and further behind the rest of England. Where mining flourished, new enclosures were still made, but the miners were a notoriously unstable population, and their smallholdings reverted to waste as mining centres shifted. Thus the activities of miner-smallholders and farmers both tended to produce a landscape of small, enclosed, occasionally used, rough pastures on land which the late Tudor period had shown to be capable of more intensive use.

Growing regional differentiation in the Peninsula

Slight variations, which had been developing at an almost imperceptible rate in a practically homogeneous area, became noticeable in the closing years of the eighteenth century. Slowly over the preceding two centuries the northern interior had begun to differ from the remainder, as mining became concentrated there, and with it the type of enclosure peculiar to the miner-smallholders. The southern parishes for their part had brought greater proportions of their land up to what might be called the "in-field standard" of cultivation. But as far as agriculture was concerned these variations were quite superficial. Ready conversion from arable to pasture was the rule. The plough was used all round the holding, but irregularly and haphazardly, exhausting the soil wherever heavy manuring was not possible. Grains were the paramount crops and were succeeded, whenever the yield began to fall off, by grass or furze, depending on position in relation to the homestead or the main occupation of the tenant. Livestock was hardy and plentiful, but of poor quality, and agriculture in general was traditionally primitive over the whole peninsula. Then with the last years of the eighteenth century came fundamental changes in husbandry which produced the first really distinctive agricultural subdivision.

The improvements in quality of livestock, the improved strains of grain crops, the increasing knowledge of roots and rotations, all of which came with the Agricultural Revolution, began to reach Eastern Cornwall during the last two or three decades of the eighteenth century and were to be seen in the west before 1800. Many accounts of Cornish husbandry written around this time

have been criticized for painting too gloomy a picture—and not without some justification. Between about 1790 and the end of the Napoleonic War, Cornish agriculture certainly underwent more changes than it had previously done in centuries. Documentary evidence shows reclamation and planting going ahead quite rapidly in many areas. Many landlords were setting an

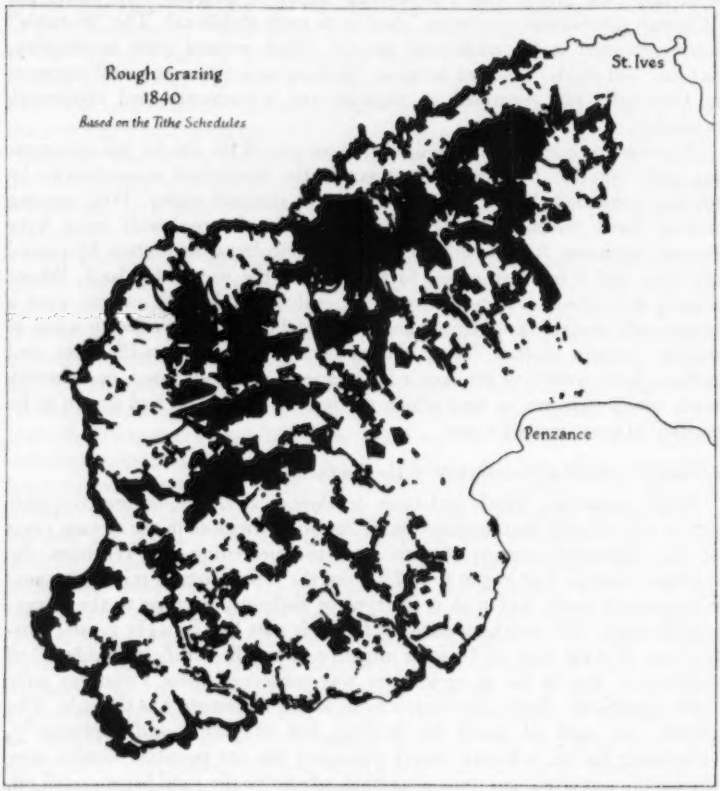


Figure 3

example with new methods of husbandry; the newly formed Royal Cornwall Agricultural Society was encouraging changes throughout the county; and amongst the progressive areas must be included the immediate vicinity of Penzance where a combination of new knowledge and traditional methods such as the application of sea-sand, "ore-weed," and pilchard manure, was giving the area a reputation of more than local importance—though not yet as vegetable and flower land. But in the Land's End Peninsula the progressive area was very limited, corresponding quite closely to the market-garden land of to-day. The remainder changed little before the second half of the nine-

teenth century—and for good enough reasons. Mining was more profitable than ever, both to owners and miners. The uplands were amongst the most inaccessible areas in Cornwall, and transport was costly and difficult in the absence of any roads but mule tracks. Above all, the soil and climate were not well suited to the cereal crops which were all important in what was still

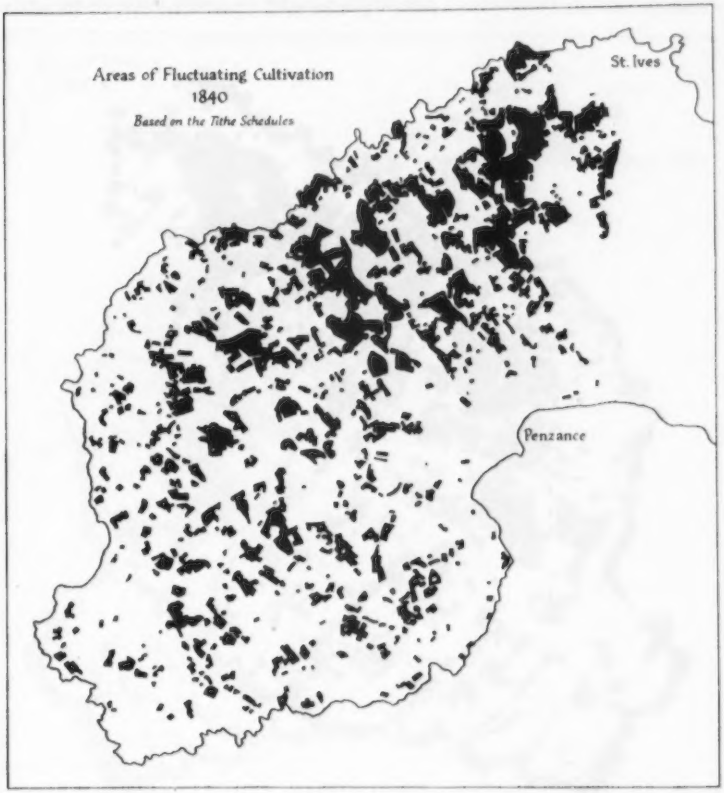


Figure 4

fundamentally a subsistence economy. It is not surprising that the new husbandry stopped short at the windswept mining areas.

Although technical changes were practically unknown in the uplands, conditions were not completely static, for during the first forty years of the nineteenth century the enclosure movement went ahead until by 1840, if not before, the picture as we know it to-day was completed. The archaeological work necessary to date all the walls in the peninsula has not been done, but there is no doubt that the early nineteenth century saw the final phase of enclosure. But the importance of enclosure in this area does not lie in the

dates of specific walls. It is the underlying idea which matters, and for hundreds of years (perhaps for two thousand years and more) this has remained the same. There is no doubt that Napoleonic enclosures traversed many areas which had known earlier walls, made of the same material and in much the same manner. There is no doubt that they were broken in by methods used in Tudor times, and which were by no means innovations then;

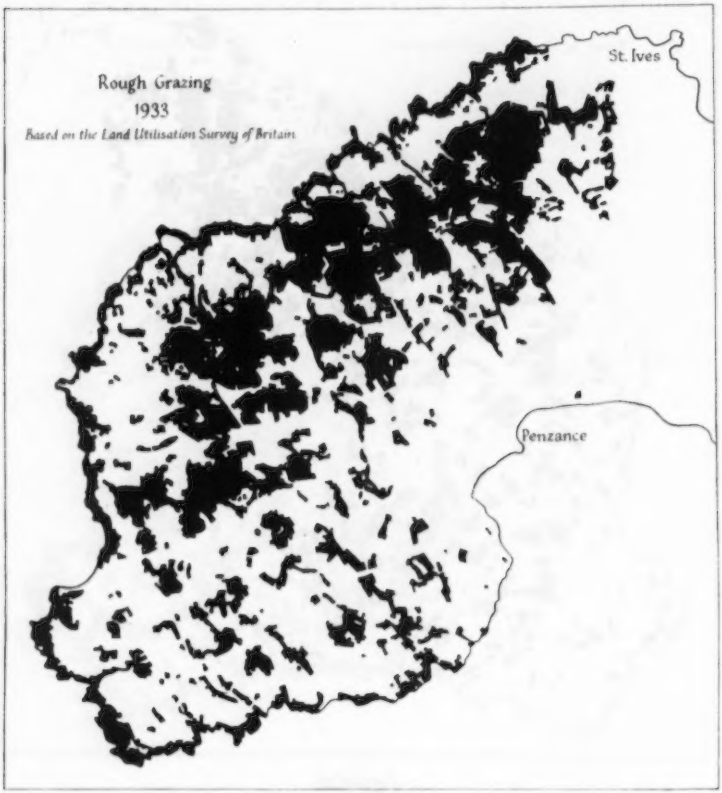


Figure 5

and there is no doubt that some enclosures, old and new, were growing wheat, barley, oats and "pillez," whilst others had already reverted to furze. Right up to 1817 there is evidence that crofts were only temporarily enclosed, and it appears that many existing croft walls were built around this time, but these like all other changes in the uplands up to about 1840 were nothing but minor variations on the age-old theme.

By 1840 records were much more comprehensive, and in the Tithe Redemption Maps and Schedules we have a complete land use picture which

can be directly compared with those of later years. They are particularly important as they show the maximum extent of arable in this area; 1870, the golden age of arable in England and Wales, having no particular significance here. Figure 3 shows how considerable the arable acreage was, though it must be stressed that it includes rotation grass, and that it cannot indicate the efficiency of the husbandry. The tithe schedules show that the three exposed

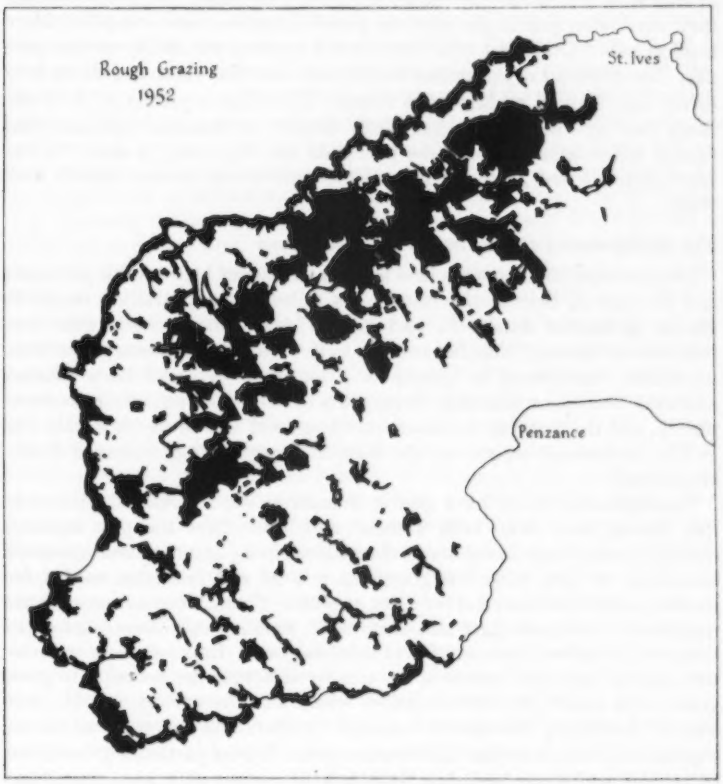


Figure 6

northern parishes (see Fig. 1) had conspicuously low yields per acre, but that they also had proportionately high arable acreages to offset the low yields, as should be expected in a subsistence economy. The parish of Paul and the southern portions of Madron and Gulval, on the other hand, had both high arable acreages and high yields, showing the extent to which they had been drawn into the progressive agricultural area of the south-east; whilst the transitional areas had moderate yields from fairly high arable acreages, reflecting greater returns for the somewhat more careful methods

employed where mining was not profitable, plus their natural advantages over the exposed northern areas for cereal cultivation. The shaded area on Figure 3 indicates various types of rough grazing at the time of the survey; but under the system of husbandry still in vogue, the area of these fluctuated greatly from year to year, and the areas of fluctuating cultivation (indicated in the tithe schedules by the term "croft," which was more precisely defined in 1840 than it is to-day) are shown in Figure 4 regardless of the use to which they were being put at the time the parish schedules were compiled. Here in effect is the "Celtic Out-field" and the link between pre-history and present-day. The existence of this under-utilized land over the whole area shows how firmly the "Celtic" tradition was rooted. The relative paucity of it in the south (but well beyond the immediate vicinity of Penzance) indicates that further differentiation within the peninsula was beginning to show. In the years that followed 1840, the present-day agricultural pattern rapidly took shape.

The development of the modern agricultural pattern

Despite many differences in land use and husbandry between this peninsula and the rest of Britain, the district has followed the prevailing trends in British agriculture during the past hundred years, more closely than ever before in its history. This has entailed more changes in a century than were previously experienced in twenty-five, but these have not been effected uniformly over the whole area. Some parts have been by-passed almost completely, and the fact that we have a problem rural area to-day is mainly due to the detrimental aspects of the historic legacy having remained firmly entrenched.

Developments which have greatly influenced the agricultural picture in this district have been both national and local. Over the past century, through general improvements in the national living standard and increased knowledge of diet, there has grown up a large and profitable market for market-garden produce, and for dairy produce. Tremendous advances in the technique of transport have also been made, enabling this remote district to compete in national markets for perishable goods. Improvements in communications have also benefited the area by removing the necessity to grow grain crops under physical conditions which were never very suitable, and also by developing the tourist industry. Further, many of these advances, together with the new types of consumer demand, were particularly beneficial to an area which was suffering from lack of contact with agricultural improvers, but which had a long tradition of mixed farming based on the inclusion of leys in the rotation. Consequently after about 1870, when in the country as a whole it ceased to be profitable to concentrate on large cereal acreages, the Land's End Peninsula found itself eminently suited for, and in the forefront of, the new agriculture—due partly to imported improvements in technique, but largely because its natural assets and traditional methods took on new values. The production of early vegetables and flowers became a major industry wherever shelter from the strong winds was possible, and in practice this proved to be in the area which had been the most advanced agriculturally since the eighteenth century; that is, around Penzance, on the

land shown as Class 1 on Figure 1. There also developed a well defined mixed-farming area with a strong emphasis on dairying, corresponding to the Class 5 land on Figure 1. Here, between 1870 and 1933, there was a 25 per cent. increase in leys within the total improved area, and grain crops declined in favour of feeding crops and main crop potatoes. The number of sheep fell rapidly, but cattle increased greatly in number and were improved in quality, whilst pigs became very important after 1918.

The changes which occurred in what is now the dairy belt were in many ways greater than those which transformed the Penzance area, for it is evident that in 1840 signs of improvement to the fundamentally "Celtic" husbandry then in vogue on the lower plateau level of the peninsula were very meagre. The changes were successful largely because they fitted well into the environment, but it has already been shown that physical conditions are not very different on the upper plateau level, which to-day is largely waste. To understand why the upland core never became adjusted to modern conditions, it is necessary to look once again at local mining, which still remained a hindrance to agricultural development. The industry was more prosperous than ever during the 'forties and 'fifties of the nineteenth century, and the effect on agriculture was much the same as in other periods of mining prosperity. The workers continued to cultivate their smallholdings, but larger and larger areas were abandoned as the industry became more capitalized and more localized. Mining maintained a large population and provided the non-mining areas with ready markets, and the drift from the country, which in many parts of England and Wales became so serious in the 'forties, was here held in check. But quite suddenly in the mid 'sixties, as a result of overseas competition, the industry began to decline rapidly and almost died out. A large population became redundant and the exodus began—the smallholdings would not provide a living from agriculture alone, and the new dairying, especially on the small family farms of this area, could not absorb the new supply of labour. Ex-miners emigrated or moved to the prospering coastal tourist districts, and the interior took on an air of depression which it still retains. Half-derelict hamlets and old mineworkings, plus a network of derelict enclosures, point to a more flourishing past. Then came the twentieth century with its great improvements in roads, its piped water and electricity, and its advances in social services; and here it found a half-empty land which was by no means being utilized to the full. Unfortunately modern roads and services, with their high overhead costs, tend to concentrate where population is large and compactly settled, and this thinly settled area became less and less attractive. Consequently, for technical and social reasons, the new dairying belt failed to spread across the barrier of the old mining districts.

Figure 5 shows the rough grazings in 1933. Comparison with Figure 3 shows how little the ratio of improved land to rough grazing had changed in nearly a hundred years—an unsatisfactory state of affairs. The position was even worse than is shown on the map, for in 1840 much of the shaded area was "croft" and was occasionally cultivated, whilst in 1933 it was all lying waste. Further, the unshaded area on the 1933 map is meant to illustrate improved land, but it does not show the wasteful manner in which some of it was used, nor the leys which were deteriorating until they were

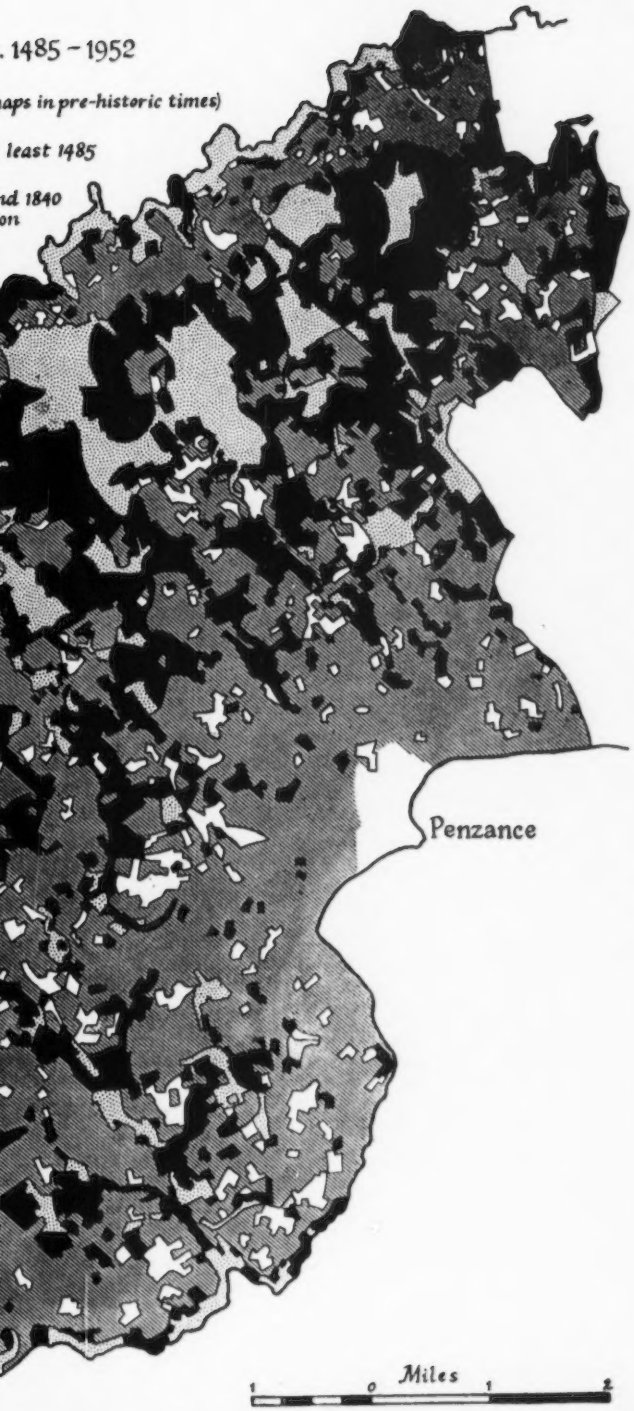
Fig. 7 Changes in the Margin of Cultivation c. 148

Areas which have never been cultivated (except perhaps i

Areas which have been cultivated regularly since at leas

Areas which came into cultivation between c. 1485 and 18
and which have since remained in regular cultivation

Areas of fluctuating cultivation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unrecognizable as improved pastures. Yet conditions in the peninsula reflected market conditions of the day. What is much more surprising is the course of agricultural development during the twenty years which followed 1933. A world war and an attempt to feed a blockaded nation resulted in a vigorous ploughing-up campaign which greatly altered the land use pattern of Britain; but in Western Cornwall little was done. Ploughing, as such, meant little to an area without permanent grass in the accepted sense, which had continued to be ploughed regularly, if somewhat infrequently in parts; and it meant even less to the intensively cultivated areas of the south. A change of crops was possible, but unlikely to be particularly successful in these areas so suited to the types of farming they already practised. Increased production might have resulted from reclamation of the rough pastures, whether enclosed or unenclosed; but beyond the odd field being drained and taken in, nothing was done to cultivate these areas which had, at one time or another, mostly known the plough. Access was difficult, particularly for modern equipment, and especially where the bulk of the reclaimable land lay along the line of the watershed which had been by-passed by modern roads, too late to be attracted by its old wealth. Population was badly distributed after the movements of the previous decades, and there was not, during the war, the necessary means to effect a redistribution more in keeping with requirements. Neither was it certain that conditions making such a redistribution desirable would be lasting. Finally, there was a lingering underestimation of the potential productivity of this land, which prevented any action on a scale sufficient to remedy the other major drawbacks.

To-day the market-garden area continues to prosper, despite problems due to continual cropping in some places. The dairying area is more prosperous than ever, and wherever a slight hollow gives shelter for early vegetables or flowers, these most profitable crops are to be seen even at considerable altitude. Conditions which made farming profitable did not end with the war, nor do they show any signs of ending. What is more important, the emphasis to-day is on the dairy produce which suits the district well. Then again there is sufficient land hunger to make young farmers consider difficult reclamation jobs, and there is already sufficient financial help available to have enticed farmers to tackle the more accessible crofts. In brief, conditions are right for a concerted attack on the waste; not least because the value of the land is being accurately assessed for the first time in years. Figure 6 shows the rough grazings in 1952. The reduction in area since 1933 is very considerable, and nearly all the changes have been made in the last five years. What is more, sufficient time has now elapsed to prove the effort worth while, and there is a desire to take the job to its logical conclusion. Accordingly, the Agricultural Land Service, the National Agricultural Advisory Service and the County Agricultural Executive Committee have completed an assessment of the reclamation possibilities of each parcel of rough land, and it shows a very large area to be capable of reclamation at reasonable cost. The way is open for further agricultural development, by the application of more modern techniques to those aspects of traditional husbandry which have stood the test of time.

The use of historical evidence in land use work

Reclamation will involve expenditure of both private and public money, and careful consideration of every individual contract; for it is essential that care be taken, at the earliest stage, to avoid waste of effort and money on land not suitable for reclamation. Hence the value of such historical evidence as is outlined above. The opinion, arrived at after a study of history, that much of the wasteland is suitable for reclamation, has already been supported by the assessments of technical and practical agriculturalists. But the results of the historical research undertaken early in 1952 are also being used directly, as a yardstick against which modern opinion can be checked. Figure 7 shows, in map form, the areas which, in the past, have fluctuated in and out of cultivation. Compiled from many historical sources, it should prove sufficiently accurate over the vast majority of the 70,000 or so fields included within its coverage to help modern improvers avoid most pitfalls.

The history of Land's End Peninsula has been a long one. Even before the settlement by Celtic-speaking peoples, this peninsula seems to have had distinctive characteristics, and throughout two and a half millenia there have remained features which mark it off as a small, compact, geographic region. The agriculture has derived its character from several sources—its "Celtic" origins, the physical characteristics of the area, and its subservient role to the mining industry. To-day the agricultural picture is still a distinctive one, but all in all it is not a satisfactory one. The "Celtic" legacy has proved neither wholly good nor wholly bad, while the physical nature of the area seems on the whole to favour agriculture. Yet considerable promise is by no means fulfilled, and for reason we must look mainly to those many centuries of profitable mining activity. The land is offering more than we have yet managed to take, over that barrier of two thousand five hundred years.

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EFFECTS OF WEATHER ON THE DETERMINATION OF HEIGHTS BY ANEROID BAROMETER IN GREAT BRITAIN

B. W. SPARKS

ALTHOUGH TECHNIQUES for the correction of readings taken with the surveying aneroid are well known, the instrument has not been much used by geographers. This is no doubt due to the variable errors introduced by changes in the general atmospheric pressure. It is unfortunate that the aneroid barometer has been so neglected, as the rapidity with which heights may be determined by it is a real advantage. There are of course many problems in which it would be totally wrong to sacrifice accuracy to speed of operation, but in others it is immaterial if an error of a few feet is made. In such geomorphological problems as the mapping of old erosion surfaces, which because of dissection are unlikely to be at their original elevations, precise levelling may give a false air of accuracy. The mapping of these features probably requires an accuracy of + or −10 feet if the landforms are old and + or − 5 feet if they are younger and better preserved. Although the technique described below has been used mainly in such problems, it probably has a wider application. Undergraduates in the Department of Geography at Cambridge have measured the heights of wells with it in the course of a survey of the water-table in the Chalk south of Cambridge. It may possibly interest the micro- and local climatologists if they wish to determine quickly the height relations of certain phenomena.

The mistrust of the aneroid has been reflected in the remarks made about it at various times. As an example one may quote a paper by George [1] in which the author claimed an accuracy of + or − 5 feet, and a contributor to the discussion considered that errors of 15–20 feet would be likely to occur. Neither of these opinions was supported by concrete evidence. On the other hand, the aneroid has been used in the Tropics with much more confidence. The major pressure change in these regions is diurnal, so that a reasonable degree of accuracy can be obtained by applying a correction based on the assumption that this change is always the same. Hinks [2] for instance quotes the use of the aneroid in Southern Nigeria for plotting fairly accurate contours, and Sutton Bowman [3] has made aneroid traverses in Nepal of up to six weeks and found closing errors of as little as 4 feet. In our latitudes however conditions are by no means so settled. The daily change of pressure is small and usually completely dwarfed by pressure changes due to the development, movement and dissipation of low- and high-pressure systems. Corrections for these largely unpredictable changes can be made from the pressure trace of

[1] T. N. George (1942). "The Development of the Towy and Upper Usk Drainage Pattern." *Quart. J. Geol. Soc.* 98, 89.

[2] A. R. Hinks (1947). 'Maps and Survey,' 5th Edition reprint, Cambridge.

[3] T. Sutton Bowman (1934). "The Aneroid Barometer in Reconnaissance Work." *Proc. World Petroleum Congress*, London, Vol. 1, 230.

an aneroid at a base station. But research has often to be done by one person; hence the need for knowing what errors one man is likely to make.

The only obvious way of correction is to run a traverse from one point of known elevation to another, to time the beginning and ending of the traverse and the intermediate readings, and to distribute the closing error proportionately among the readings on the assumption that pressure change has been constant. In England such a technique means the use of 6-inch maps, as these show the greatest proportion of spot heights, bench marks and trigonometrical stations. The work for which this technique was evolved [1] demanded an error of not more than 5 feet, while a period of one hour allowed a reasonable traverse to be made. Therefore the investigation described below was primarily designed to find those meteorological conditions in which the assumption of a constant pressure change for a period of one hour resulted in a maximum error of 5 feet. For this purpose, pressure changes in different types of weather situation were plotted as apparent rises and falls in elevation by means of the height scale of the aneroid. The observations were taken at fifteen minute intervals. Smaller intervals were used for experimental purposes, but they gave graphs which did not differ significantly from those obtained from readings taken every fifteen minutes. The instrument used was a 5-inch Short and Mason aneroid reading to the nearest foot and compensated for temperature changes. From the graphs the error in a corrected traverse of one hour can be easily measured. The various meteorological situations have been defined below as suitable or unsuitable. Such a classification is somewhat artificial as weather situations are extremely variable, but for practical purposes some division has to be made. Ultimately, each day's suitability for aneroid surveying has to be judged on its own merits.

SUITABLE WEATHER SITUATIONS

The following conditions are adequate, provided that the wind does not exceed force 3 (12 m.p.h.) and that the air is not very unstable. These two points are discussed in more detail later.

Anticyclones

Pressure changes in anticyclones are small and consist of two elements: a slightly irregular change due to the development and movement of the system, and a rhythmic change due to the diurnal variation of pressure. In our latitudes the amplitude of the latter is of the order of 0·9 millibars or 25–30 feet in terms of elevation. It is most noticeable in summer anticyclonic conditions.

Four typical anticyclonic pressure traces are illustrated in Figure 1. Curve A (period 1015–1715, local time, 11 April 1948) shows minor fluctuations due to the irregular intensification of an anticyclone over the British Isles. Curve B (period 1000–1545, 9 October 1948) shows the pressure change in a weakening anticyclone and the morning peak of the diurnal variation at 11 a.m. A later period (1730–2200) of the same day, curve C, illustrates the

[1] B. W. Sparks (1949). "The Denudation Chronology of the Dip-Slope of the South Downs." *Proc. Geol. Assoc.* 60, 165.

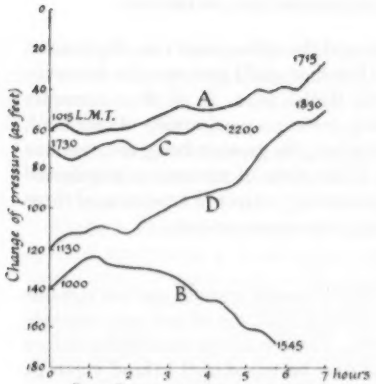


Fig. 1 Pressure change in anticyclones

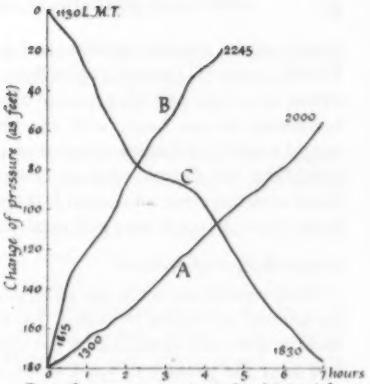


Fig. 2 Pressure change ahead of and behind fronts

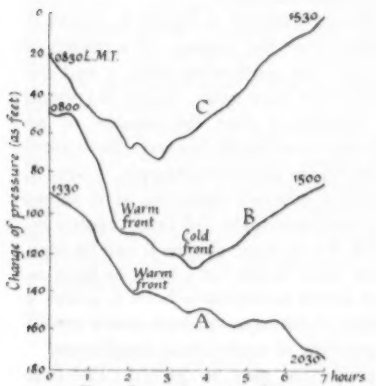


Fig. 3 Pressure change at fronts

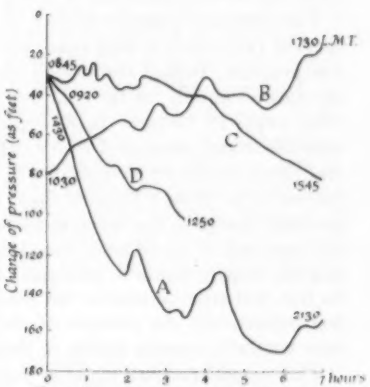


Fig. 4 Pressure change in unstable air masses

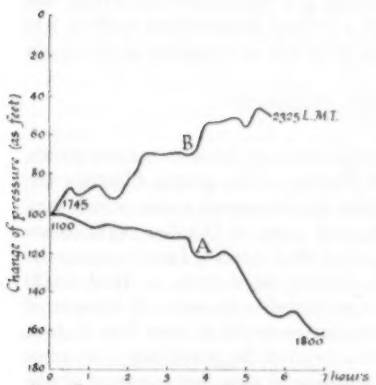


Fig. 5 Pressure change due to irregular development

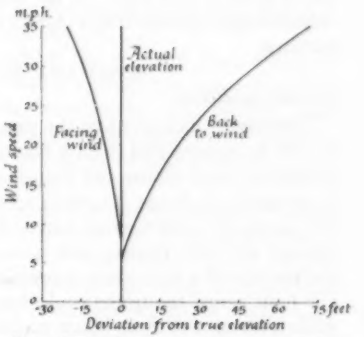


Fig. 6 Effect of wind velocity on aneroid readings in a wind funnel

trough of the diurnal variation at 6 p.m. and the subsequent rise of pressure. Finally, curve D (period 1130–1830, 30 October 1948) portrays the intensification of a ridge of high pressure over the British Isles. In all these examples a traverse of one hour, with the closing error proportionately distributed, would result in a maximum error of 4 or 5 feet, the greatest being in a traverse straddling the diurnal peak or trough. If the time of traverse is lengthened the maximum error increases: it is approximately 10 feet in a traverse of three hours, but 15 feet if over a diurnal change of pressure tendency.

Large changes of pressure

Such conditions occur ahead of and behind frontal systems and are suitable for aneroid surveying provided that the wind is light, the air not very unstable and the front not straddled by the traverse. The conditions are fulfilled before and after the passage of weak fronts and may be found well behind vigorous fronts, when wind and instability have decreased. The closing errors are large, but corrections result in very small residual errors.

Two graphs of pressure in such situations are shown in Figure 2. Curve A (period 1300–2000, 2 May 1948) was taken after the passage of a trough of low pressure. Behind the trough the wind was north-west force 3 and the sky cleared rapidly, as the cold front had been very weak. Curve B (period 1815–2245, 18 October 1948) depicts conditions after the passage of an unstable trough associated with a depression over South Norway. Both wind and cloud conditions were similar to those of the previous example. Curve C (period 1130–1830, 7 January 1949) covers a different situation, as it shows pressure change in the warm sector of a depression, the fall being caused by the approach of a cold front over Ireland. From these graphs it can be seen that the closing errors in traverses of one hour might have been as large as 60 feet, but after correction the residual errors would have been 3, 4 and 5 feet respectively. An increase of the time of traverse to three hours would have resulted in errors similar to those possible in anticyclonic conditions.

Two actual traverses made in such conditions may be quoted. The first was of sixty-nine minutes' duration and resulted in a closing error of 77 feet, but after correction, an intermediate reading at a trigonometrical station was found to be 1 foot high. In the second a correct intermediate reading was obtained after distributing a closing error of 40 feet in a traverse of ninety-six minutes.

UNSUITABLE WEATHER CONDITIONS

Frontal conditions

Traverses which straddle the passage of fronts are liable to serious errors, as will be appreciated from a glance at Figure 3. The graphs illustrate the passage of weak fronts and therefore show the minimum errors which may be expected at fronts. Curve A (period 1330–2030, 16 October 1948) shows the passage of a warm front; curve B (period 0800–1500, 4 January 1949) the passage of both fronts; and curve C (period 0830–1530, 4 April 1948) the passage of a secondary depression is an unstable air mass. A traverse of one hour across the fronts could have resulted in errors of from 8 to 14 feet, while a traverse of three hours would have involved the possibility of an error of 25 feet in the third example. It is interesting to note that traverses of one

hour in the pre- and post-frontal fluctuations of pressure would have involved errors of only 2–5 feet. Such conditions have been discussed above.

Unstable air masses

The sources of error are to be found in the marked local changes of pressure which characterize unstable conditions. The greatest errors are found in the most unstable air masses.

Figure 4 illustrates air masses of decreasing order of instability. Curve A (period 1430–2130, 2 April 1948) covers a time when the wind was south-west force 6–8 and squally, while almost continuous showers of hail and rain fell from a virtually complete cover of cumulo-nimbus clouds, the tops of which reached to above 20,000 feet. Curve B (period 1030–1730, 8 April 1948) shows the effect of the diurnal increase of instability cloud. At the beginning, the pressure trace is smooth, but as the small cumulus build up to cumulo-nimbus and hail showers develop, the pressure trace becomes more and more irregular. Curve C (period 0845–1545, 15 October 1948) shows the reverse effect: showers in the early part of the period decrease and the graph becomes more regular later in the period. Curve D (period 0920–1250, 3 April 1948) shows less unstable conditions when occasional showers fell from isolated cumulo-nimbus clouds. The maximum errors in traverses of one hour in these four situations would have been 21, 13, 10 and 7 feet respectively. Three-hour traverses would not have caused such large increases as occur in situations already described, as the maximum errors would have been 32, 24, 13 and 13 feet respectively. It is obvious that the presence of large convectional clouds and showers is a warning not to attempt aneroid traverses. In addition, the presence of strong winds in unstable conditions is a further deterrent.

Irregular development of pressure systems

This omnibus heading is designed to include days when the weather is dominated by shallow depressions over southern England and northern France, by certain types of wave development and by frontal systems which are weakening irregularly. The perversity of the weather in such situations is indicated by the lower degree of accuracy of the weather forecasts. Figure 5 shows pressure change in two of these situations.

Curve A (period 1100–1800, 1 May 1948) is the pressure trace ahead of an almost stationary, unstable trough, which extended westwards across England from a depression over South Scandinavia. The weather was showery with broken cumulus and cumulo-nimbus cloud. The irregular trace shows the combined effects of the development and movement tendencies of the trough, which later moved south.

Curve B (period 1745–2325, 22 October 1948) is composed of a number of pressure tendencies: a cold front extending from the Wash to Pembroke was retarding and decreasing in intensity, but nevertheless caused a slight fall; while the intensification of an anticyclone to the south-east and the diurnal rise of pressure both induced a rise. Both these situations would have caused maximum errors of 10 feet in corrected traverses of one hour and 19 and 14 feet respectively in traverses of three hours.

The effect of wind

It has been mentioned that winds above force 3 have serious effects on aneroid results. The source of the trouble is in the eddies which form in the lee of irregular masses, whether they be mountains or surveyors. If the aneroid is held at chest level, a normal practice designed to avoid the large temperature differences which occur on different types of surface, the reading obtained facing the wind will differ from that obtained when one's back is to the wind. The latter reading will be higher, due to the reduction of pressure in the lee of the body, and the former will be lower. The difference between the two increases very approximately with the square of the speed of the wind: it is only 1–2 feet in a wind of force 3, but rises to 10–15 feet in a force 5 wind, 20–30 feet in a force 6 and 45–50 feet in gale (force 8). These figures are approximations only as the aneroid needle is very unsteady due to the gustiness of the stronger winds. The effect was tested in a wind tunnel, but as it was only 4 feet square in cross-section, the body of the person reading the aneroid caused a considerable constriction in the tunnel and local acceleration of the wind. Thus the differences between the two readings was magnified, as can be seen from Figure 6. The experiment was performed in anticyclonic conditions and there was no change of atmospheric pressure to affect the readings.

It might perhaps be thought that the effect of wind could be overcome by taking all readings either face to or back to the wind, but this is not so. In irregular topography there must be eddies of varying importance in valleys and hollows. So even if all readings were taken in the same position relative to the wind, they would also have to be in places of equal exposure. A traverse from a hill top to a valley bottom would give a positive closing error even had no change in the general atmospheric pressure occurred. Topographical effects of this type were tested in a chalk pit on Highdown Hill in Sussex. The western face, 21 feet in height, provides eddies in the pit during the prevailing westerly winds. The aneroid was set at zero in the bottom of the pit and then the height of the western face was measured by it. The results are tabulated below.

	Upper edge	
Wind force (Beaufort)	*Facing wind*	*Back to wind*
5	10 feet	23 feet
5	10 ,,	24 ,,
6	5 ,,	29 ,,

The heights obtained by facing the wind are badly inaccurate, as the negative height error in this position combines with that of the positive height, due to the eddy in the pit, to decrease the apparent difference in elevation. The back to the wind readings give better results as the two positive height errors tend to cancel out. The compensation is not exact, especially in the stronger wind, as the eddy round the body causes a greater increase of apparent elevation than does the eddy in the pit. The effects of wind are therefore so variable that it is best not to undertake aneroid surveying, if accuracies of + or − 5 feet are required, in winds above force 3 (12 m.p.h.). The eddy effects must also cause errors in correcting readings by means of an aneroid at a base station,

as it is highly unlikely that the exposure of the two instruments will always have been the same.

OTHER POSSIBLE SOURCES OF ERROR

The errors due to variation in atmospheric pressure are the largest in our latitudes, but two other sources deserve to be mentioned. The first is due to the temperature of the air column, but this can practically be eliminated by running traverses from valley bottom to hill top and *vice versa*. Any error due to the temperature of the air column would then appear as a closing one and would be automatically distributed among the readings. The second lies in the possibility that the aneroid does not immediately settle into equilibrium with the general atmospheric pressure. Various opinions have been expressed on this point, but experience suggests that there is very little time lag with a good aneroid. For instance, at the end of the experiment in the wind tunnel, the reading fell from 120 feet to zero in a few seconds when the extractor fan was stopped, and the new correct reading was obtained almost immediately. Such rapid descents never occur in the field and I have never obtained better readings by tapping the aneroid gently for any length of time before reading it.

CONCLUSION

If strong winds, unstable air conditions, the passage of fronts and irregularly developing systems are avoided, the surveying aneroid need give no more than an error of 5 feet in a corrected traverse of one hour's duration. Longer traverses involve greater errors and each surveyor must decide on the degree of accuracy he requires, as this will govern not only the length of traverse but also the number of days on which surveying can be undertaken. The Airmet broadcasts formerly provided an admirable description of the situation over the British Isles, but unfortunately they have ended. A general inference can still be obtained early in the morning from the B.B.C., and this will help to decide on the suitability of a day for surveying. As a test the elevation of Highdown Hill, Sussex (269 feet O.D.) was measured fifteen times from the 21-foot spot height on the road to the south in conditions judged to be suitable. The times of traverse ranged from twenty-two to eighty-six minutes, the closing errors from −25 to +28 feet, and the corrected results gave seven correct measurements of the hill, four which were 1 foot high or low, three which were 2 feet high or low and one which was 3 feet high.

The following table gives a brief summary, for the years 1948–49, of the number of days falling within the various suitable and unsuitable categories outlined above. Some days, unsuitable for two or more reasons, are included in that class of weather which appeared to be predominant. The two areas selected are probably the best and worst areas in Great Britain for aneroid surveying. If errors of more than 5 feet were allowed the number of suitable days could obviously be increased.

	South-east England		*North-west Scotland*	
Suitable	*Summer per cent.*	*Winter per cent.*	*Summer per cent.*	*Winter per cent.*
Anticyclones	48	36	25	14
Large changes of pressure ..	11	12	8	5
Total ..	59	48	33	19
Unsuitable				
Frontal passage	10	19	22	24
Instability	5	9	16	29
Irregular development ..	16	6	11	4
Strong winds	10	18	18	24
Total	41	52	67	81

In the table summer is defined as the six months April to September inclusive and winter as the remaining months.

INTERNATIONAL GEOGRAPHICAL CONGRESS, WASHINGTON, 1952

THE SEVENTEENTH International Geographical Congress met, at the invitation of the United States National Committee, at Washington, D.C. from August 8 to 15. It was housed on the whole of a floor of the Hotel Statler. The conference arrangement were in the hands of the United States National Committee, whose Chairman was Wallace W. Atwood, Jnr., and they proved most admirable in every detail. More than 300 individuals actively assisted the National Committee and to all of them the 1200 registered participants in the Congress were greatly indebted. Among the 1200 were about forty from the United Kingdom. The National Committee and many American universities were very generous in the ways in which they made it possible for very many delegates to attend the Congress in spite of the severe financial restrictions imposed upon them by the currency regulations of their own countries. In this connection the Wallace W. Atwood Memorial Travel Grants merit special mention.

National exhibits featured representative official and unofficial maps and publications. The British exhibition included publications and maps of the Royal Geographical Society, the Ordnance Survey, the Directorate of Colonial Surveys, the Admiralty, the General Staff of the War Office, and the Ministry of Town and Country Planning. It had an important location and generous space and was much admired. There was also a good representation of the maps, atlases, globes and books of commercial map and book publishers, as well as a special exhibit entitled "Geographical Exploration and Topographic Mapping by the United States Government" on view at the National Archives building, and another exhibition of rare maps and atlases at the Library of Congress. Finally, the National Geographic Society, whose house is located very near to the Hotel Statler, arranged special exhibitions and guided tours of its editorial, cartographic and printing departments.

Before the Congress opened, specially organized and conducted tours to the Industrial Areas of the North-eastern States and to New England had been arranged. After the Congress there were two more, one to the southern Appalachians and many of the South-eastern States, and another which was of transcontinental dimensions. In all these tours a 30 per cent. reduction was granted to Congress members from countries other than the United States. The thanks of all taking part in the tours were richly deserved by those who had organized or conducted them as well as to the writers of the first-rate handbooks.

The section meetings were well attended and accounts of some of them are given below. L. B.

Biogeography

Professors Henri Gaussen and Niels Nielson presided over this Section, which held one morning session, and met again the next day to discuss the problems in mapping vegetation at the scale of 1 : 1,000,000. The discussion

made little progress beyond A. W. Kuchler's (United States) proposal of a method which combines floristic with physiognomic features. It is hoped that this method will be tried out in the United States whose size and variety of environmental conditions will afford a good test. Professor H. Bobek (Austria) described the ecological regions of Iran. F. H. W. Green (Great Britain) described the changes in vegetation on the mud and sand banks in Poole Harbour and related them to the tidal currents. Professor F. K. Hare (Canada) communicated some provisional conclusions based on the mapping from the air of the boreal forest of Labrador-Ungava. Jacques Rousseau claimed a new biological zone for the "emulsion" of arctic (tundra) with subarctic (forest) which he called the "Hémiarctique."

The Commission on Medical Geography held an afternoon session at which the Commission's report prepared by Max Sorre (France) and Arthur Geddes (Great Britain) was discussed. Max Sorre also presented some interesting maps of French epidemiology and Mme. Beaujeu Garnier (France) showed maps of infant mortality in France for the years 1947–50 and also for the summer and winter. A. T. A. Learmonth (Great Britain) gave a preliminary analysis of the intensity and variability of natality and mortality and also the mortality from certain specific diseases in India, using the Census and the all-India Health Reports as sources. Papers were also submitted on the incidence of Beri Beri and the Tsutsugamushi diseases in Japan, revealing some important and interesting facts of geographical distribution. A. A. M.

Cartography

The first session was devoted to historical papers. In one of these, Miss Eila Campbell discussed the development of the "characteristic sheet," or key to map symbols, from its introduction by German sixteenth century cartographers to its maturity in the early nineteenth century. An interesting discussion following R. Haardt's paper gave evidence of wide interest in early globes (extending even to Japan).

In the second and third sessions the emphasis was on modern cartography. Hans Peter Kosack proposed symbols to meet the special requirements of the polar areas for the International Map of the World. Lyman J. Briggs showed films of recent solar eclipse expeditions sponsored by the National Geographic Society. Norman Pye explained a semi-graphic construction for the conical orthomorphic projection and Erwin Raisz described the project for a 30-foot diameter globe which is intended to show land types in natural colours and to indicate cities, roads, railways and shipping lanes by tiny coloured lights. Joseph E. Williams reviewed lessons to be derived from consideration of the principles of colour perception and John C. Sherman explained the methods used to obtain plastic shading to give a three-dimensional effect in maps. A. J. Pannekoek stressed the need for density of population maps that would be independent of administrative boundaries. Geographers will note with considerable interest that André Libault presented some samples of the several new sheets of the Atlas de France that are being prepared to replace existing ones.

The Commission on the Bibliography of Ancient Maps was appointed in

1949 to undertake, under the chairmanship of Professor R. Almagià, a critical bibliography of maps produced before A.D. 1700. The period A.D. 1200–1500 was selected as the first stage of the work. In the British Isles the collection of material has been organized by G. R. Crone and R. A. Skelton, and the principal work of cataloguing carried out by Miss Elizabeth Harvey. Marcel Destombes has collated and edited the material thus brought together. At the Washington Congress the Commission presented the first fruits of its labours in two fascicules: the first containing Professor Almagià's report and three specimen sections on manuscript maps (the Macrobius maps, the Hereford world-map, and Catalan charts of the fourteenth century); and the second with Destombes's Bibliography of Printed Maps before A.D. 1500.

The Commission on the International 1 : 1,000,000 Map of the World, appointed in 1949 with John K. Wright as chairman, has reviewed the present procedure and future policy for producing this map, particularly in view of the resolution of the Economic and Social Council of the United Nations (27 July 1949) that the Central Bureau of the International Map should be transferred to the United Nations. The Commission recommended that the International Geographical Union support this transfer, with reservations. Finally the Commission reaffirmed, and urged members of the Congress to represent to their governments, "the need for basic topographical mapping throughout the world, not merely as a proper basis for the International Map, but also as a first essential in economic and social development."

N. P. and R. A. S.

Climatology

This Section (Professors A. Austin Miller and Hermann von Wissman presiding) was allotted one afternoon and had a very crowded programme which left little time for discussion. T. Sekiguti (Japan) calculated correlation coefficients of certain climatic elements between adjacent stations in Japan and used these in an attempt to detect climatic boundaries. Professor Leo Aario (Finland) summarized post-glacial climatic changes and cultural developments in Europe and Egypt and appeared to regard variations of insolation as the prime cause. Professor C. Warren Thornthwaite (United States) described his methods of accurately determining the warmth and water requirements of crops as a basis for scheduling their ripening for processing. J. C. Pugh (Nigeria) analysed rainfall reliability in Nigeria. Professor Carl Troll (Germany) used cartograms of diurnal and seasonal changes of temperature in a discussion of "Thermische Klimatypen der Erde." Professor A. Austin Miller (Great Britain) considered the geographer's needs in the definition of climatic regions and illustrated the use of a threshold temperature of 43° F. in a simple subdivision of temperate climates. Professor E. E. Lackey (United States) examined weather records and discussed the probability of the occurrence and duration of specific temperature conditions. A. A. M.

Demography and cultural geography

Under the presidencies of Professors Ferdinando Milone (Italy) and Hilgard O'R. Sternberg (Brazil) this Section had a full programme. Contributors came from the United States, Italy, Eire, France, Germany, Gold Coast, Great Britain, Finland and China, showing how widespread is the

interest in this type of geography. A paper by Professor Robert S. Platt (United States) gave an argument as to the justification of cultural geographical work being pursued. The most significant study of the older methodology was that by Wilbur Zelinsky (United States) which analysed house-types after a sample field-study, while that by Professor Edward L. Ullman (United States) dealt with a geographer's ingress into the newer forms of planning.

Demographical studies were the principal theme of the final session of the Section. Contributions from France dealt with the region of the French Alps with emphasis on cultural and human migration, while the other British contributors (T. E. Hilton and R. J. Harrison Church) were concerned with West Africa. Largely owing to the action of A. Geddes (Great Britain) attention was focussed on the work of the Commission on Population Mapping. A collection of maps for this Commission was prepared by Professor A. G. Ogilvie, and was on display during the Congress. The varied approaches to Population Mapping revealed by this were illuminating. It is to be hoped that the illustrations with the text of the brochure written by Professor Ogilvie can be made available to a wider audience, in order to clarify for all those who use population maps, the difficulties and weaknesses of certain techniques encountered during the preparation of various types.

A. C. O.

Geomorphology

An interesting and varied programme of communications on geomorphology occupied four full sessions at Washington, and an extra session for the fuller discussion of one group of topics was also arranged. Professor Hassan Awad (Egypt) and Professor Marguerite Lefèvre (Belgium) presided. W. G. V. Balchin and E. H. Brown were both concerned with aspects of platform development and chronology in Britain and Professor Lefèvre contributed an important paper on "Un niveau d'érosion universel à 200 m d'altitude." In the same general context A. Tammekann (Finland) discussed the correlation of coastal terraces, K. Kularatnam dealt with tectonic relations of erosion surfaces in Ceylon, while J. Tricart and A. Cailleux (France) reviewed ancient and present conditions of peneplanation. The discussion on the topics raised by this group of papers was vigorous and voluminous. Despite the labours, recently concluded, of the "Commission pour l'étude des terrasses et surfaces d'aplanissement," it is evident that no consentient view had emerged on the nature of planation and its control by eustatic or other movements. The extra discussion was devoted entirely to these topics.

Another group of papers dealt with glacial geomorphology. T. M. Griffiths (United States) reported on recent work on Mount McKinley, L. García-Sainz (Spain) dealt with the last interglacial retreat in the Pyrenees, S. Erinç dealt with the present glaciation of Turkey while Professor Hans Boesch (Switzerland) summarized recent investigations of rock glaciers by the Swiss National Parks Committee. Other papers were contributed by F. Hjulström (Sweden) on the "sandurs" of Iceland, by R. J. Lougee (United States) on the post-glacial warping of eastern North America and by H. Mortensen (Germany) on "Die horizontale Temperaturschichtung in der Würmeiszeit."

There was a notable concentration of interest upon the processes of

weathering and erosion. Professor D. L. Linton offered a novel and convincing discussion of the formation of tors. A. J. Guilcher (France) made a comparative survey of the forms due to coastal solution weathering of limestone in different climates, J. Roglić (Yugoslavia) described erosion surfaces in the Dinaric karst and G. Rougerie (France) examined the process of the removal of silica in solution in humid tropical climates. Of kindred interest were Professor Steers's summary of the coastal investigations of the Cambridge School, a contribution by A. Schou (Denmark) on wind control of shorelines and coastal dunes, a discussion of river planation by Professor H. von Wissmann (Germany) and of the water erosion and mass-movement activity in progress in the Maritime Alps by J. Pouquet (France).

Regional geomorphology was represented by accounts of the granitic country of North-western Iberia by P. Birot (France), of the Argentine Puna by W. Czajka, and of the Ranchi Plateau by Professor S. P. Chatterjee. Space does not permit extended mention of the group of papers delivered under the aegis of the Commission on periglacial morphology, Ambassador H. W. Ahlmann presiding. They dealt with periglacial phenomena in Scandinavia, the Low Countries, France, Italy, Africa and the Argentine. S. W. W.

Historical and political geography

At the Lisbon Congress in 1949 Historical Geography was linked with the History of Geography to form a Section largely occupied with cartographical sources. The Washington programme, on the other hand, was so organized that papers dealing with ancient maps were included within the section on Cartography, and Historical Geography as such was linked with Political Geography. A group of papers presented several aspects of geography of eastern and northern Europe: H. L. Kostanick discussed the "post-war expansion of Slavic settlement in Eastern Europe"; Professor Trevor Lloyd, the "Norwegian–Soviet frontier in the Pasvik Valley"; T. Shabad, "recent changes in the political geography of Eastern Europe"; and H. R. Wilkinson, ethnographic maps with special reference to eastern Europe. Among other papers were those dealing with India, Brazil and northern Eurasia. Different in character from these political–historical themes was Professor A. M. Meyer's discussion of the changes since 1830 in the area to the south of Lake Michigan, and of the importance of these changes in the evolution of the modern landscape.

The division of material at any Congress must be to a large extent artificial, and several papers on Historical Geography appeared appropriately in other sections. Two of these which dealt with source material were Professor W. G. East's account of large-scale English maps in the eighteenth century and Herman R. Friis's paper on south-western Wisconsin in 1839.

H. C. D.

Hydrography

The Section held one session on Monday forenoon, August 11; J. M. Wordie presiding, and G. Medina, Secretary. Six papers were read; (*a*) Professor J. Gentilli: "Seasonal river regimes in Australia"; (*b*) A Steiner (Switzerland): "The filling up of the Lake of Thun"; (*c*) Professor E. Fels (Germany): "Der Ioánnina-See in Griechenland"; (*d*) J. Russell Smith

(United States): "Some possible results of desalting sea water by the Permionic Membrane Demineralization Process"; (*e*) R. H. Fleming and F. E. Elliott (United States): "Some physical aspects of the in-shore environment of the coastal waters of the United States and Mexico"; (*f*) J. Grelier (Venezuela): "Évolution des conceptions sur la formation du Cassiquaire" (read in the author's absence by J. Robert, France). Above fifty attended the Section. The discussions on the first three papers were brisk and lively.

J. M. W.

Regional geography

This Section, over which Professor Carl Troll and Professor B. Ž. Milojević presided, offered an opportunity for the consideration of what must always be regarded as one of the central objectives of geographical study. Professor George Chabot (France) in an admirably concise statement defended regional geography as being just as strictly scientific in its methods as the systematic branches. In advancing an American view of regional study, Professor Derwent Whittlesey (Harvard), while denying the existence of the region as a self-given entity, emphasized its importance as a tool for geographical work. Two papers were read by German geographers; one by H. Lautensach on the regular variation of landscape phenomena ("Formenwandel") over the earth's surface, and the other by F. Schneider, emphasizing the importance of statistical data in regional work. The subject of the comparative rating of the world's regions was introduced by Professor S. S. Visher (Indiana) and illustrated by a table showing the provisional ratings of eighty regions with respect to each of thirty criteria.

Of the papers devoted to specific areas, a consideration of the regional divisions of China (Professor Hung Fu), the landform divisions of Japan (A. Watanabe) and the agricultural-geographic regions of Denmark (H. Kampp) all raised questions of methodological approach. More orthodox studies were represented by an intensive treatment of Ibiza, the smallest of the Balearic Islands (Professor P. Deffontaines) and a summary of the regional units of Yugoslavia (Professor B. Ž. Milojević) on a physical basis.

Somewhat surprisingly the meeting of the Commission on Regional Planning under the chairmanship of Professor Jean Gottmann, which had been concerned with aspects of geography having obvious scope for practical application, proved a rather disappointing session. The contributions dealing with regional planning in the Netherlands, Norway and Sweden stressed the importance of non-statutory as compared with statutory planning in countries where the latter has not proceeded far. The value of such work is seen for example in the survey programme of the Royal Board of Agriculture in Sweden, as part of its policy to rationalize agriculture on a regional basis. A concluding paper (Clark N. Crain, United States) pointed to the need for making surveys of smaller communities. The analysis of their development problems by members of university graduate schools of geography, as in the case of Denver where community surveys of various small towns are now in progress, was recommended, not however without some discussion of the geographer's proper role in the planning field.

K. C. E.

Resources, agriculture and industry

Under this omnibus title approximately thirty papers were communicated during four sessions. The papers, though extremely heterogeneous, showed an agrarian bias. Their settings ranged from the tropical (soil exhaustion in Timor, welfare plans in Java, rice paddy in Japan) to the cool temperate margins (pioneer fringelands of the Great Plains of Canada, pasture and livestock regions in North European Russia). Old and New World Mediterranean topics included the alpine economy and field patterns of Slovenia and the specialized farming of the Oxnard Plain. Field patterns were kindred to the theme of Professor C. Troll's agricultural landscape studies from the Rhineland; while to the same small-scale farming operations belonged Professor P. Veyret's study of *petit bétail.*

The mid-nineteenth century warning finger of George Perkins Marsh—whose conservation proposals were the subject of a paper—seemed to be held up to Algeria (as evidenced by M. Tabuteau) as well as to the American Great Plains and their irrigation problem (R. L. Anstey). An unusual land use recommendation by F. George was for the examination of neglected Burmese and Indian land revenue returns. Professor W. William-Olsson, introducing the proofs of his economic map of Europe and Sven Dahl, presenting a marketing survey of Sweden, were among the few who described new methods as well as giving new material. Similar to their approaches were W. L. Garrison's "Qualitative changes in the areal structure of employment" and M. E. Marts' "Indirect benefit analysis in irrigation projects."

Professor S. H. Beaver compared E. W. Miller's observations on Connelsville's declining beehive coke industry to his own on north-eastern England; while R. E. Dickinson suggested affinities between the methodology of time-use material from Finland and his inquiries in north Italy. Technical progress in illustration was evidenced in that coloured slides virtually ousted black and white. Coloured illustrations were employed with equal effect from Professor H. O'Reilly Sternberg's descriptive study of drought conditions in Brazilian Ceara, to Professor H. Boesch's treatment of new trends drawn by his students in their Swiss alpine field work. Perhaps Professor Boesch also contributed the most human aphorism to the section; "Geography should be a happy subject; it should not be taken so very seriously." W. R. M.

The teaching of geography

Limited to a single afternoon session of the Congress, the Section on the teaching of geography had a very full programme. Leonard Brooks, one of the Society's representatives at the Congress, gave a stimulating paper on "Geography teaching in school." School geography must be a training in the geographer's characteristic methods and point of view; it must study human experience regionally, enabling children accurately to imagine how other people live. A training in geography is indispensable to good citizenship. For the United States, Gilbert Grosvenor, the Editor of the *National Geographic Magazine*, emphasized the value of well illustrated and readily understandable articles. Warm tribute was paid to his work for the National Geographic Society, whose membership now numbers two million. T. F. Barton (United States) described the developing interest of primary school children in

geography, and said that their studies should start at home and work outwards. N. V. Scarfe (Canada) described a variety of researches into children's interest in and comprehension of geographical ideas, materials and methods. One of the British contributors was Miss G. Hickman, who showed the value of approaching regional work through a local example. E. W. H. Briault urged that local work should be integrated with the remainder of a school course in the study of topics each beginning locally and moving outwards to the homeland and the world; the use of large-scale maps and pictures would similarly enable regional study to be approached through pseudo-local study.

E. W. H. B.

Trade and transportation

Under the chairmanship of Professors Stanley H. Beaver (Great Britain) and Axel Sømme (Norway) this Section had one main meeting. The bulk of the papers presented were concerned with trade, and it seemed significant to the writer that the United States contributors focussed attention on their peripheral areas of Honduras and Alaska while there was no study of the incredible traffic-flows across the main area. Can it be that the textbook surveys are regarded as significant, or is it that the subject still lacks sufficient pioneer studies to attract workers into the field? Professor E. L. Ullman (United States) convened a meeting of those present at the Congress and known to be interested in railway studies set in their geographical background, to try to stimulate such work.

Parallel with this Section, the Commission on Industrial Ports met under the chairmanship of Professor W. E. Boerman (Netherlands) and there was a full discussion as to the past work of the Commission. Eventually there was agreement that the two main branches needing amplification, beyond the International Geographical Union's brochure, were a bibliography of "type" port studies and a report detailing the information obtainable from the port statistics of various countries.

A. C. O.

Urban and rural settlement

The programme under this heading afforded rather a miscellany of papers without a definite unifying theme; and in any case the actual presentation of the papers was often poor, a circumstance which made discussion difficult. British geographers themselves contributed three well presented and clearly argued studies concerned with rural-urban relationships. F. H. W. Green made a comparison of public transport in Britain and certain West European countries as an index of urban spheres of influence; R. W. Steel discussed the special conditions affecting the study of settlement geography in various parts of West Africa; Professor E. H. G. Dobby, in a particularly competent statement, gave an account of the recent settlement changes in South Malaya.

Most of the remaining papers dealt with the settlement patterns of specific areas ranging from Puerto Rico and the West Indies to Sweden and India, with a more elaborate essay from Professor Deffontaines (Canada) examining the conditions promoting certain types of rural settlement in French Canada.

K. C. E.

World land use

The Lisbon Conference of the International Geographical Union in 1949 appointed a Commission to study the possibility of a World Land Use Survey, under the chairmanship of Professor S. Van Valkenburg of Clark University, United States. The Commission met at Clark University in December 1949. It was proposed that pilot surveys be carried out in as many parts of the world as possible, and it was later agreed that Professor Van Valkenburg should endeavour to arrange for such surveys in different parts of the Americas, whilst Professor Stamp undertook to set up headquarters in London to deal with the countries of the Old World. Through the generosity of the Royal Geographical Society accommodation was provided for the Old World Divisional Headquarters to be in London, and work started in January 1951, with J. Callow as Organizing Secretary.

In Washington, the printed report referred to work supervized from London which had been undertaken in many countries, including Malta, Cyprus, South Africa, Lebanon, Cyrenaica, Eastern France, Ceylon, India, Iraq, Western Germany and Burma. A special display of maps prepared from air photographs by the Organizing Secretary, J. Callow, and Mrs. G. E. C. Stone covering parts of Nyasaland and Tanganyika on the scale of 1 : 50,000 was given. This illustrated the vast amount of detail which could be mapped from air photographs combined with a limited number of checks on the ground.

An impressive record of pilot surveys on different scales of different parts of Canada was presented by J. Wreford Watson, of Ottawa. Professor Preston James then dealt with the importance of mapping on chorographic scales (for example 1 : 1 M) which had been carried out under his direction in Brazil. Professor Henri Gaussen demonstrated the differences between his point of view and that originally proposed by the Commission. He considered it possible to indicate by appropriate colours not only the type of vegetation, *e.g.* high forest, but the physical conditions of rainfall and temperature prevalent in the area by using an appropriate range of colours. His cultivated lands are left white, so that symbols can be placed over the areas indicating actual crops.

In press interviews Professor Stamp expressed the view that $1 million spent on land use surveys in all the underdeveloped lands might well save a waste of a billion dollars by schemes rendered abortive through insufficient knowledge. The Lisbon meeting of 1949, recognizing the world importance of soil erosion, set up a Commission to deal with this subject. Some difficulties had been found in organizing the work of a Commission covering such a huge field, and it was agreed that those aspects of the Commission's work which were appropriate should be merged with a new Commission set up to deal with Evolution of Slopes. L. D. S.

Taken as a whole the Congress was a great success. Professor George B. Cressey was a very popular and sagacious President and to him and to George H. T. Kimble, the Secretary-General of the Union, must go much of the credit for the smooth, efficient and happy way in which the various activities were carried out. The election of Professor L. Dudley Stamp as

successor to Professor Cressey was received with acclamation and gave particular pleasure to delegates from Britain. Professor Stamp has already entered upon his duties and will preside at the General Assembly which will take place in Rio de Janeiro in 1956, Brazil having been selected by ballot as the next country to visit.

Of the "academic" meetings those meriting special mention were Professor Cressey's address on "Land for 2·4 Billion Neighbours," the symposium on World Food Supply, the meeting to discuss the work of the Commission on World Land Use, and the brilliant lecture by Ambassador Hans Ahlmann which was the third Isaiah Bowman Memorial Lecture, given under the auspices of the American Geographical Society.

Of course the importance of the papers read at the Sectional Meetings must not be under-rated, but the lasting impression of most delegates will be of the contacts made with geographers from many parts of the world, of old friendships strengthened and new ones formed, of the generosity and warmth of American hospitality both public and private, and a strengthening of belief and confidence in the important contribution that a training in geography can make to the education and outlook of citizens of to-day. L. B.

THE ORIGIN OF THE BROADS

J. N. JENNINGS AND J. M. LAMBERT

IN AN R.G.S. Research Memoir just published,[1] a theory attributing the origin of most of the Norfolk Broads to certain natural physiographical processes was advanced. Briefly, it postulated that the formation of the broads could be explained in terms of a geologically very recent marine transgression of the Norfolk river valleys, during which a thick wedge of estuarine clay was laid down over the earlier valley peats; the broads themselves were thought to have been initiated as discontinuous lakes, lying in natural hollows in the peat filled with water ponded back between the flanges of the clay and the upland valley margin (by-passed broads), or in tributary valleys whose mouths were blocked by the clay (side-valley broads). This theory was based mainly on stratigraphical data obtained by boring through the alluvial deposits of the Ant and Bure valleys, and, although certain difficulties of detail were admitted, the conclusions reached seemed to be in very general accordance with the evidence at the time of submission of the manuscript in December 1950.

In conjunction with the physiographical work in the Bure valley, a vegetational survey was also made, in which the present pattern of the plant communities was related directly to the gross and detailed stratigraphy of the underlying deposits.[2] Between 1950 and 1952, this combined vegetational and stratigraphical work was extended by one of us (J. M. L.) to the Yare valley. Here, the increasing emphasis on the detailed interpretation of the vegetation in terms of the stratigraphy has required progressively much more closely set lateral bores than were employed to give the general physiographical outline in the Bure and Ant valleys, and, arising from this, important new data have come to light calling for a major reconsideration of the earlier hypothesis of the origin of the broads.

Convincing stratigraphical evidence has now been obtained to suggest that all the Yare valley broads are artificial. Their basins are formed by undoubted excavations, usually reaching down to 3 metres or more below the present surface level, and presumably representing hollows left by deep extraction of peat in historical times. This view is further supported by cartographical and other data. A reconsideration of the evidence previously available from the Ant and Bure valleys, supplemented by additional observations since made in certain critical areas, now suggests that this explanation is of general application for the origin of the typical by-passed broads as a whole, though reservations, through insufficient data, must still be made in respect of the less numerous side-valley broads.

A full presentation of the new evidence, and an assessment of the relationship of the artificial basins of the broads to the natural stratigraphy of the valleys, will be made as soon as possible. In the interim, it should be emphasized that the greater part of the story of the natural evolution of the river valleys, as distinct from the origin of the broads themselves, remains substantially unchanged from that presented in the Memoir.

13 November 1952.

[1] J. N. Jennings, 'The origin of the broads,' *R.G.S. Research Memoir*, No. 2 (1952).

[2] J. N. Jennings and J. M. Lambert, "Alluvial stratigraphy and vegetational succession in the region of the Bure valley broads. I. Surface features and general stratigraphy," *Journ. Ecol.* 39 (1951) 106; II. Detailed vegetational-stratigraphical relationships. *Journ. Ecol.* 39 (1951) 120.

RECENT PAPERS ON THE COAST OF ENGLAND AND WALES

J. A. STEERS

A CONSIDERABLE AMOUNT of interest has been taken in the coast and adjacent sea-floor of Great Britain since the war. It seems therefore worthwhile to call attention to papers concerned more particularly with the geographical and geological aspects of coastal morphology, which are scattered through very different types of journals, and so may easily escape the notice of those for whom they are intended. In our own *Journal* Miss M. A. Arber gave an account of the cliff profiles in Devon and Cornwall,[1] and thus extended the observations made known by her father in 'The Coast Scenery of North Devon' (1911). Recently W. G. V. Balchin, continuing his work on Cornwall has given us a paper on the high level surfaces and their relation to the coast of North Devon. J. Challinor added a chapter to his earlier work on the Cardigan coast in the form of a note on convex erosion slopes in North Cardiganshire,[2] and E. H. Brown [3] has analysed comprehensively the erosion surfaces of the same area. These three papers are however only incidentally concerned with the coast.

C. A. Cotton [4] discusses our south-western coasts, and thinks the morvan theory, slightly modified, explains their structure better than the fault theory outlined by Suess. He regards the English and St. George's Channels as old features. The deepening of the valleys, later drowned by the Flandrian transgression, took place in times of glaciation. He thinks the tempo of coastal erosion has been slow owing to the great width of the continental shelf. Thus shoreline details survive from an interglacial age. His explanation of the bevelled form of some of the cliffs depends on two cycles of erosion, and so differs from Miss Arber who regards the distribution of bevelled cliffs as being controlled by structure, especially jointing. Other differences of opinion arise over the rate of cliff retreat in relation to valley truncation and the preservation of raised beaches.[5] Cotton also alludes to The Needles of the Isle of Wight [6] and regards them as the surviving remnants of a plunging cliff which has been subjected to lateral erosion by the sea. Cotton's treatment of these two problems is theoretical, and scarcely takes local details sufficiently into consideration.

Two other papers related to the morphology of the coastline of Cornwall and Devon come from André Guilcher. In "Aspects et problèmes morphologiques du massif de Devon–Cornwall comparès a ceux d'Armorique" [7] there are some general observations and sketches of coastal phenomena. In a paper entitled "Nivation, cryoplanation et solifluction quaternaries dans les collines de Bretagne occidentale et du nord du Devonshire "[8] he calls attention to the form of the Great Hangman, Holdstone Down, and Trentishoe Down. These

[1] *Geogr. J.* 114 (1949) 191.
[2] *Geography*, 33 (1948) 27.
[3] *Institute of British Geographers, Transactions*, 1950 (published 1952), 49.
[4] *Geological Magazine*, 88 (1951) 113.
[5] *Geological Magazine*, 88 (1951) 219.
[6] *Geological Magazine*, 89 (1952) 221.
[7] *Revue de Géographie Alpine*, 37 (1949) 689.
[8] *Revue de Géomorphologie dynamique*, No. 2 (1950) 53.

are just behind the coast, but if we are to interpret coastal scenery in a comprehensive way we must include high level and upland plains and related features. Although the pictures of Holdstone Down and of a hill in Alaska given in Guilcher's paper show a striking similarity, there is certainly room for more than one interpretation of their appearance.

Guilcher in *Revue de Géographie de Lyon*, 26 (1951) 311, summarizes the work of a conference held in Paris in January 1951. The paper deals with the formation of the North Sea and Straits of Dover, and the adjacent plains. It is mainly concerned with submarine features including particularly the banks in the North Sea. J. H. F. Umbgrove [1] in a short paper which is in essence but a summary of the second chapter of his 'Symphony of the Earth,' 1950, discusses the structural boundaries of the Netherlands and the origin of the country—and since the Netherlands form part of the North Sea Basin, this paper is also largely a study of that Sea. Both may be read in conjunction with a paper by H. Valentin entitled "Der Nordseeraum an der Wende Tertiar-Quartär" [2] which is concerned with the evolution of the North Sea Basin particularly in relation to the crags and the glacial period.

In the *Scottish Geographical Magazine*, 68 (1952) 64, A. H. W. Robinson describes recent work on the floor of the British Seas. In view of the increasing information accruing from sonic sounding the details of the sea floor are becoming much clearer, and any proper appreciation of coastal scenery should take these into account. This point was emphasized in an earlier paper by Robinson [3] in which he calls attention to a sounding of 177 fathoms off Caol Rona—so far the deepest sounding on the continental shelf of these islands. Not far away a depth of 138 fathoms was obtained in Linnhe Crowlin. W. B. R. King [4] brings together the scattered information concerning the geology of the eastern part of the English Channel. He analyses this and relates it to the structure of the adjacent coasts. In so doing he finds evidence for a continuation of the echelon folds across the Channel, and calls attention to the possibility of a large outcrop of Triassic rocks south of the Isle of Wight.

There are also some recent papers dealing with local shoreline studies. In the *Proceedings of the Geologists' Association*, 63 (1952) 20, G. Wilson discusses the influence of rock structures on the coastline and cliffs near Tintagel, one of few accounts of the intricate relations between structure, lines of weakness of various kinds, cliff form and wave attack. The district affords wide variety of rock and great complexity of structure, particularly at Willapark, Barras Head, and Tintagel Island. The island stands salient because the base of its cliffs is mainly made of resistant volcanic rocks. The phyllites, in the form of a thrust-mass separated from its roots, rest on the basement. To-day the sea is having but little effect on the seaward side, but landwards where faults cut through the cliffs, the sedimentary beds beneath the volcanics are brought up into the zone of wave erosion, and caves are being cut through the promontory. Some stretches of the neighbouring coast are regarded as true fault line cliffs

The cliffs locally are bevelled—Hog's Back—cliffs. Wilson discusses this matter in the light of Miss Arber's and Cotton's theses, and particularly of his own observations, and is of the opinion that Cotton's theory of two-cycle erosion explains many of the features.

The coast of Lincolnshire has, until recently, not been studied in the detail it deserves. A. E. B. Owen in *The Lincolnshire Historian*, Spring 1952, reviews

[1] "Overdruk uit Geologie en Mijnbouw," June, 1951.
[2] *Die Erde*, 1951–52, 285.
[3] *Scottish Geographical Magazine*, 65 (1948) 20.
[4] *Quarterly Journal Geological Society*, 104 (1949) 327.

the historical evidence of coast erosion in the eastern parts of the county, and finds that five medieval parish churches—Mablethorpe St. Peter's, Trusthorpe, Sutton, Chapel and Skegness—have been lost to the sea. Ingoldmells and Addlethorpe have also suffered severely. The Lincolnshire coast is not as attractive as that of other counties, and a casual visit may not reveal either its intrinsic interest or the seriousness of the erosion. After a storm, when the beach has been swept away and has exposed the ravined boulder clay beneath, is the time to realize that all is not well.

Owen's account includes records of severe storms and floodings of salt water as far back as the thirteenth century. The significance of continuous erosion from Roman, and presumably earlier, times at Ingoldmells was demonstrated some years ago by Swinnerton, and the present paper calls attention to medieval accounts of erosion at that place. Skegness, too, has suffered much in the past. In the second quarter of the fifteenth century it had a considerable coastal trade, but accounts have often exaggerated the importance of its former haven. The *ness* vanished long ago; it may have been near the Old North Common.

A little to the south of Skegness, at Gibraltar Point, there is a good development of beach, dune and saltmarsh. This locality which is also a Bird Observatory and Field Research Station has been studied by F. A. Barnes and Miss C. A. M. King of the Department of Geography in the University of Nottingham, who have published a preliminary survey as part of the Annual Report of the Observatory for 1951.

Material travels southwards along the Lincolnshire coast, and at the mouth of the Wash forms a wide beach on which low ridges of shingly and shelly sand gather. The newer of these ridges extend nearly due southwards, and enclose a triangular flat between them and the older ridges and dunes. This sandy-muddy flat is being colonized by *Spartina townsendii* and *Salicornia* spp. The older dunes are extensive to the north and east of the observatory and inside them is a marsh with plants generally typical of the east coast. The creeks in it are also of interest.

The development of the Gibraltar Point is worth watching: the building up of new ridges, the gradual accumulation of mud, and the associated ecological variations are all significant. The authors have made a reliable base map which shows clearly both the main physical and ecological characteristics. They have also carried out a good deal of levelling, and obtained useful spot-heights in the older marsh.

C. Kidson, in *Institute of British Geographers Transactions* (1950) 67, gives an account of the double sandspit, called Dawlish Warren, at the mouth of the Exe. Like other such formations it is set a little back from the trend of the shores on either side. The Inner Warren is separated from the Outer by a low area in part of which lies Greenland Lake, now often dry.

The Spit has been surveyed many times because it is of no small significance from the point of view of navigation. Kidson himself has also mapped it and indicated the major changes that have taken place since 1743. It is prolonged eastward by the Pole Sand. There is no doubt that the material of which it is formed came from the west, but since the railway has been built the supply has been seriously depleted. But even before the railway was made, the spit suffered loss. Kidson suggests that following the post-glacial rise of sea-level, the headlands to the west, Langstone Rock and Clerk Point, extended much farther seaward. Erosion may well have been more rapid, and this, coupled with deposition in the river mouth, caused a shallowing and so produced conditions favourable for the development of a spit. Gradually the erosion of the headlands lessened, and in consequence the supply of material.

What has been said so far applies only to the Outer Spit. The Inner has been built by sand blown by the wind from the Outer Spit. All reliable records show no change in the location of the Inner Warren: all that has happened is erosion by wind and wave of its exposed north-eastern end. Since the supply of material to the Outer Warren is now so small, erosion is serious, and the Warren is wasting away rapidly. This was long ago noticed by Martin, and Kidson concludes his paper with the remark that the next one likely to be written on this locality will no longer record a Warren, but a series of shoals instead!

Volume 90 of the *Sussex Archaeological Collections* contains a paper on the estuary of the Adur by H. C. Brookfield, who adopts a new and more convincing explanation of the evolution of this part of the Sussex coast. An offshore bar formerly existed on either side of the Adur, and enclosed both natural and reclaimed marsh. The greater tidal flow of the river maintained a direct outlet through the bar which, however, gradually moved inshore, thus restricting the ebb and flow, which were also lessened by reclamations. Thus the mouth contracted and was deflected to the east.

The changes in the form of sand and shingle ridges on the north Norfolk Coast have received comment in the *Transactions of the Norfolk and Norwich Naturalists' Society*, 17 (1951) 206. A considerable amount of mapping was done in the summer of 1951: this demonstrated changes which had taken place, and serves as a basis for future observations. A map on a scale of nearly two inches to the mile accompanies the paper.

Finally, a note on "A Principle in Coastal Geomorphology" [1] challenges rightly the too easy assumptions and deductions which are sometimes made from classifying shorelines into Submerged and Emerged—and other—classes. These are relative terms, and in Britain, for example, glacial and post-glacial fluctuations of sea-level, to say nothing of the way in which the sea works on the varying nature of the rocks facing the coastline, are factors which probably outweigh any generalized classification.

[1] J. Challinor, *Geography*, 34 (1949) 212.

FROM THE *JOURNAL* A HUNDRED YEARS AGO

THE FOLLOWING EXTRACT on the work of the Ordnance Survey from Sir Roderick Murchison's Presidential Address for 1853 (*Journal of the Royal Geographical Society*, vol. 23, pages lxxxix–xc) relates to a phase in the "battle of the scales." Ireland had been surveyed on the six-inch scale between 1824 and 1846, and it had been decided in 1840 to survey Scotland and northern England on this scale. This decision was the subject of controversy for many years, as the extract shows. After six Scottish counties had been completed, work was stopped in favour of the one-inch survey. Finally, in 1863 it was decided to map Great Britain on the scale of twenty-five inches to the mile. The publication of the one-inch map of Scotland was not completed until the 'eighties.

Having at our last anniversary referred you to the various endeavours I made in former years, whether as your President, or as the representative of the British Association, to accelerate the progress of a survey of Scotland which began in the last century, I regret to say that the distinct recommendation of the Committee of the House of Commons in 1851, on which I so much counted, has been, from what I can learn, to a great extent paralysed. That Report strongly recommended that the sum of 25,000*l.* per annum, which was obtained, and which has since been increased to 35,000*l.*, should be first exclusively devoted to the completion of a really useful map, on the scale of one inch to the mile. In consequence, however, of the petitions from various parts of Scotland, to which I alluded at the last anniversary, that view of the scheme, or the accelerated publication of a *real map*, must necessarily be very much retarded, to make way for the execution of *plans* on very large scales.

Few geographers who will take the trouble to read all the public documents connected with this subject, beginning with the appeal of the British Association to the Government in 1835 and ending with the Report of 1851, including the Report of the same House of Parliament on the results of the six-inch survey of Ireland, will, I apprehend, come to any other conclusion than that at which I arrived, or will not regret the indefinite postponement of the execution of an accessible and useful map. I now reiterate my conviction, which is that also of the eminent engineering authorities—Stephenson, Brunel and Lock—members of our body,—as well as of Mr. Keith Johnston, and all practical geographers, that a six-inch survey is much too cumbrous, and too little provided with physical features, to be useful for consultation on any matters of general or county business, and at the same time much too small for the detailed objects of the engineer, proprietor, or valuer of property. Such a six-inch survey was perhaps specially applicable to Ireland, where numerous disputes prevailed respecting the town-land boundaries in hilly districts: though many of the artificial lines and divisions of fields, laid down at much cost, have been changed, since the plates on which they are represented were engraved! No sooner, however, was this scheme completed, and in admirable style, at an expense of about 850,000*l.*, than the Irish proprietors complained through their representatives in the House of Commons, that their country was, *in reality, without a map*. And this statement, though made in the year 1847, is still perfectly true; for a six-inch survey is not a map which can be consulted, and Ireland, though long promised it, has yet no one-inch map.

THE SOVIET NATIONALITY PROBLEM

RUSSIA AND HER COLONIES. By WALTER KOLARZ. *London: George Philip and Son*, 1952. $8\frac{1}{2} \times 5\frac{1}{4}$ *inches;* xiv+335 *pages; maps.* 25*s.*

DESPITE THE LARGE number of studies appearing in the Western world on various aspects of the Soviet state, the number of works concerned with the non-Russian areas of the U.S.S.R. has remained relatively small. Those studies which have appeared in the Western languages on this subject have usually been limited to an analysis of specialized aspects of the national question in the U.S.S.R., or they have been limited to a study of small areas. Few authors have attempted a panoptic study of the Soviet nationality problem; an overall analysis of the dynamics of Soviet policy towards the non-Russian nationalities of the U.S.S.R. Yet the policy towards the non-Russians has been, and still is, one of the most important and significant facets of the modern Soviet state, one which has had effects which cannot be underestimated, particularly in the colonial and semi-colonial areas outside the U.S.S.R. A thorough and dispassionate analysis of Soviet policies in relation to the multi-national character of the U.S.S.R. is therefore of prime importance for us to-day.

In the present volume, Kolarz has presented a survey of the main non-Russian nationalities and of Soviet policy as it relates to these national groups. There can be found in this study a great many useful facts and a compilation of relevant information about the principal Soviet nationalities, including population statistics, and economic and educational data. We are also given some useful statistics concerning the ethnic composition of the various regional organizations of the Communist Party and the local governments.

Unfortunately, it cannot be said that the author has fully succeeded in presenting the kind of objective and factual study of the Soviet nationality question which is so much needed to-day. One problem is the almost unsurmountable task of surveying some forty major and minor nationalities in one limited study. Another is a tendency on the part of the author towards oversimplification which in some instances has resulted in the emergence of a one-sided picture. The author states that the primary purpose of the book is to study "the extent to which the government of the U.S.S.R. has assisted or hampered the legitimate national aspirations of the peoples of the Soviet Empire" (page iv). In relation to this consideration, the author holds that Stalinist policies expressed in the purge of the 1930's foiled earlier attempts to establish a greater degree of national equality within the Communist Party and a genuine federation within the U.S.S.R. Since then, according to the author, the Communist Party has been primarily an instrument of Russian policy vis-à-vis the non-Russian nationalities. Basically, Kolarz holds, the October revolution was a Russian revolution and the Communist Party is only a Russian party bound to pursue Russian national aims. Stalin's victory over the opposition forces within the Party signify that the Party and the Soviet government are now carrying out a policy of centralism which requires the triumph of the Russian language and Russian civilization over the cultures of the national minorities. Thus, according to the author, the present Soviet regime continues very much the same Russification policies which had been pursued by the Tsars. Kolarz finds that the result is a crisis in the relations between the central Soviet authorities and the non-Russian nationalities. The author ascribes the failure of the Soviet

nationality policy not only to policies of the government but also to several independent factors, such as the numerical disproportion between Russians and non-Russians which ensures Russian domination and the dispersal of the main two Slavic groups, the Russians and the Ukrainians, throughout the entire territory of the U.S.S.R.

To this reviewer the problem seems to be whether such considerations as Russification and imperialism are in themselves sufficient criteria in analysing the quite complex Soviet nationality problems. There is little doubt that since the last war there has been a decided increase in the stress on the Russian nation "as the foremost nation of the U.S.S.R." and that there has been considerable revision of the official attitudes towards Russian nineteenth century colonization of such areas as Central Asia, where Russian civilizing benefits are now stressed considerably more than before. This is only one aspect of the Russian nationality policy and indeed a significant one. But there are also other considerations concerning the dynamics of Soviet policy. Certainly it cannot be said that all major Soviet nationality policies can be labelled purely as aspects of imperialism and Russification. There can be little doubt that serious consideration has been given to the problem of the development of indigenous cultures within a Soviet society. Moreover, some periods of Soviet history have been marked by considerably greater tolerance towards the traditional cultures of the minorities than others. Thus it would seem unwise to oversimplify the complex Soviet approach to the nationality problem, a problem which in itself involves many conflicting considerations and which has been approached in various ways during the Soviet period. It is particularly unfortunate that in relation to so complex a problem the author seems to have used his materials in a rather selective fashion, to prove what appears to be a preconceived idea. How this approach has sometimes led him astray, can be illustrated in his treatment of the Central Asian republics of Kazakhstan, Kirghizstan, Turkmenistan, Uzbekistan and Tadzhikistan. His contention is that the creation of the five republics was based on a two-fold policy: to use them merely as tools in international power politics and to disunite the nations of Central Asia who, "with the exception of the Tadzhiks . . . are all Turkic peoples, intimately interrelated" (page 259). Since they are so closely related, the author continues, the formation of a Central Asian federation would have been more logical and "would probably correspond to the desires of the peoples concerned" (!). The only reason that the Soviets have opposed federation, according to the author, is that they wished to disunify a potential cultural and political unit. Certainly in this instance the author has dangerously minimized the cultural differences between the various Central Asian nationalities. The four Turkic groups speak four distinct Turkic languages and are also culturally distinct. The Uzbeks have been traditionally sedentary agriculturists and city dwellers, while the Kirghiz, Kazakh and Turkmen have been traditionally nomadic cattle breeders. The fifth group, the sedentary Tadzhiks, speaking an Iranian and therefore Indo-European language, are completely separate linguistically speaking from the four Turkic nations. The author's statement that the separate languages of the Turkic nationalities were "created" in the Bolshevik period (page 318) overlooks the fact that separate languages existed and were recognized as such long before the October revolution. It is true that there were pre-revolutionary attempts towards linguistic unification in the sphere of literary language, but these attempts failed because the language differences between the Turkic peoples were too great. It is impossible in this brief review to attempt an analysis of the complex nationalist movements of the different Turkic groups of Central Asia. But certainly the notion that pan-Turkic federalism (with the incidental

swallowing of the Iranian Tadzhiks) is the only important and indigenous movement in Central Asia is a dangerous oversimplification.

In some instances the author hints at points which could be of utmost importance, but then either leaves his statements unsubstantiated or fails to give a source for his information. Thus he states that history is interpreted differently in the different republics and that history textbooks "produced for Kazakhs and Kirghiz and for Uzbeks and Tadzhiks conflict with each other in a number of cases" (page 260). If such differences are significant, this would be a fact of utmost importance. However, Kolarz offers no further elaboration and no source is given for this statement.

There are also some unfortunate factual errors which, it would seem, could have been eliminated by more thorough checking. A few mistakes may be pointed out: it cannot be said that most of Central Asia fell to the Russians without bloody battles (page 256). In Kazakhstan alone there were decades of bloody revolts led by such popular leaders as Isatai Taiman, Kensari Qasym, Beket Serkebaj, Eset Kotibar. It is also erroneous to state that the 'History of the Kazakh SSR,' published in 1943 under the editorship of the Kazakh historian Abdykalykov and the Russian historian Pankratova was "the first comprehensive history of a Central Asian republic" (page 269). S. D. Asfendiarov's 'History of Kazakhstan' was published in 1935.

It must be concluded that the two major shortcomings of this work are too brief and perhaps too hurried a presentation of a complex subject and too selective a choice of factual materials, with a resulting tendency to oversimplify problems which hardly lend themselves to such treatment. Nevertheless, much extremely valuable material is offered and it is hoped that the second volume which the author tells us will be concerned with the Siberian peoples, will present a rather more thorough study of an area about which we know all too little.

THOMAS G. WINNER

REVIEWS

EUROPE

CLIMATE AND THE BRITISH SCENE. By GORDON MANLEY. *London: Collins*, 1952. (*The New Naturalist: a Survey of British Natural History.*) 9×6 *inches; 313 pages; maps and diagrams; photographs in colour and black and white.* 25*s*

This handsome volume might be regarded as a geographical supplement to E. G. Bilham's more purely meteorological treatise, 'The Climate of the British Isles' (1938) based on official data, since it includes besides much physical and statistical matter a discussion of those subtle, imponderable aspects of climate which instrumental data cannot give. In preparing for such a work Professor Manley has shown both energy and enterprise as, for example, in fixing a climatological station on Dun Fell, 2800 feet, in the Northern Pennines where he had often to encounter the very inclement conditions of the moorland wilderness. The fundamental principles of weather changes and cloud formation in terms of fronts and air masses are explained with remarkable clarity, always with apt reference to local and seasonal peculiarities in different parts of the British Isles. Moreover Professor Manley certainly knows how to render "atmosphere" in a very literal sense, such as when he describes the

prodigious quantities of rain brought in winter by the wild Atlantic winds as they converge on well-known spots in our western mountains. But no doubt the success of this book in conveying the impression is largely helped by the magnificent colour photographs by Cyril Newberry and others of various types of British landscape under typical weather conditions.

The author does well to emphasize the sharp contrast through a small range of altitude between the characteristic lowland and upland scenes of Great Britain. In accounting tentatively for the relative scarcity of "tall trees" north of the Mersey–Humber line by stronger winds, rather than more general climatic factors, apart from the greater extent of elevated country, he misses just the specific feature to give more point to his argument; for it is well south of this line that the lofty common English elm, which is peculiarly susceptible to rough winds and whose splendid groups lend a distinctive note to the landscape of much of Southern and Midland England stops short.

A somewhat grim picture is presented of the smoke nuisance and the distance which smoke haze can drift, spoiling the visibility in country places, though nothing is said about the results of smoke abatement in making the winter fogs of large cities notably less dark, sooty and pungent than in Victorian days.

The prominence given to snowfall, especially in the Scottish Highlands and on the hills reflects Professor Manley's own researches in the subject. A black and white photograph from *The Times* of December 1938 showing a thick sheet of snow on the beach at Perranporth in Cornwall, close to the Atlantic's very surf line, is welcome as an instructive reminder that snow does, in fact, intrude more boldly into the flowery coastal combes of Devon and Cornwall than conventional textbook statements might suggest. The reference to British tornadoes curiously omits any mention of the outstanding recent example of May 1950 in Buckinghamshire and East Anglia (*Geogr. J.* 116 (1950) 112). It is a pity that the Exmoor cataclysm of August 1950 apparently occurred too near the date of publication to permit of inclusion in relation to great thunderstorms.

Ice Age weather is reconstructed realistically in comparison with the factors which control the situation at the present time; but as regards the minor fluctuations of climate, the uninitiated reader might like to know more about the evidence used for their close dating.

After these minor criticisms there remains to notice the last chapter which considers climate and man as an obtrusive element in the British scene, with an evaluation of "bracing" and "relaxing" local conditions. There the author is conscious of entering a controversial field but his caution in representing climate as only one of many factors affecting human life should restrain his critics.

Such a fascinating theme as the imaginative and intellectual reaction of the poets, artists and scientists to environmental influences in these islands is handled, if only briefly, with some success; and certainly the reviewer for one has not closed Professor Manley's distinguished book without a strengthened feeling that the evolution of English literature has owed no little stimulus to a richly varied landscape, complex weather moods and contrasted seasonal light effects of our marginal island climate in a high latitude. L. C. W. B.

MORE BATTLEFIELDS OF ENGLAND. By Lieutenant-Colonel ALFRED BURNE, D.S.O. *London: Methuen*, 1952. 6×8¾ *inches;* xv+216 *pages; panoramas and sketch-maps.* 21*s*

Colonel Burne has rendered a further service both to geographers and to military historians by adding eighteen more battles to his previous analytical study of English battlefields, ranging in date from the first to the seventeenth century.

In every case he has not only digested thoroughly all existing records, but has "walked the course" and given what must be accepted as a final verdict on the locality of each action. As an expert military topographer the author is unrivalled; where doubts and controversies exist, as in locating Ethandun (page 878) and Brunanburh (page 937), he calls in the intuitive aid of his old friend and guide, "inherent military probability." Few will dissent from his convincing conclusions.

The first battlefield selected is perhaps the most controversial, namely the scene of Caradoc's last stand against the Roman legionaries. Those who have stood on the triple ramparts of that remarkable rock-fortress on the south edge of Clun Forest, looking northward and eastward over the Shropshire foothills, will probably accept the logic of the author's many assumptions.

No less than seven of the reconstructed battlefields fall within the scantily documented Anglo-Saxon period of our history; in discussing Ellandun (page 825) Colonel Burne puts forward a most interesting and convincing theory regarding the purpose and origin of Wansdyke. The last four battles described are lesser known but nonetheless important actions of the Civil War.

The author has again been let down by his publisher in the matter of misprints, which are too numerous for a serious work of reference such as this. The panoramas and sketch-maps are clear and helpful. J. H. M-C.

WALES. By MAXWELL FRASER. *London: Robert Hale*, 1952. *The County Books*, $8\frac{1}{4} \times 5\frac{1}{2}$ *inches;* Vol. 1, The background, xiv+232 *pages; illustrations.* 18*s.* Vol. 2, The country, ix+260 *pages; maps and illustrations.* 18*s.*

The author declares her aim as being "to collect together all those smaller details of Welsh history, literature and tradition which are so fascinating, yet so difficult to discover for those who do not speak Welsh." In this she has succeeded, albeit that the result is a fortuitous concourse of facts, half-truths and legends gathered from geology, archaeology, history, medieval law, celtic hagiology, Welsh grammar and literature, folk lore and aught else. The author is well read in the English literature about Wales and scatters broadcast a vast assortment of information, but she has also gone to the trouble to learn something about the unwritten traditions. She is an enthusiast for the people, their way of life and their traditions, rather than for terrain and scenery. This the geographer may regret, but she writes with understanding and sympathy, and occasionally even with sentiment. The main distinction of the book is this attempt to interpret a distinctive way of life.

The County Books allocated two volumes to Wales. This has been an extravagance, for the work could, with profit, have been condensed into one. The first volume deals with the background and lays emphasis on history, literature and bardic institutions; the picture is filled with personalities and lacks coherence. The second volume is given mainly to regional description which is done by counties. As a "topography" in the older sense it is entertaining and instructive, and in the best Celtic fashion the pedigrees of towns and villages are traced through their notables. Much of this is likely to prove of only local interest, even among Welshmen, and they will often know better or more.

The books contain a great mass of material that cannot be found elsewhere in one work and there are, in particular, useful details about railways and about industries in country towns. It is unfortunate that the information is sometimes unreliable so that it cannot be used safely as a source-book and that even in straight descriptive writing accuracy is sacrificed for the sake of the picturesque.

E. D.

REINDEER ARE WILD TOO. By JOAN NEWHOUSE. *London: John Murray*, 1952. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* xiii + 174 *pages; maps and illustrations.* 16*s*

Though Miss Newhouse studied Geography at Cambridge, one of her main interests has been anthropology, and she followed up this academic career with a visit to the Lapps of Kautokeino, in Finnmark, North Norway. This book is the account of her stay among these reindeer-herding nomads, with whom she lived some nine months. That she became a servant with one family, in a society where superficial qualities such as education are assessed somewhat drastically, is sufficient testimony to her energy and perseverance. Her training gave her the opportunity to produce an interesting record of her observations, and she has written a most absorbing and true-to-life account. She relates how she followed the Lapps inland after a winter fair, participated in their spring herding, and migrated with them to the coast in the early summer.

The layman may however regret that such details of orientation as the number of reindeer required by an individual to earn his living are not covered, whilst the specialist may deplore a certain tendency to generalize, evidenced by such statements as: "bandy legs are universal among the Lapps" (page 48). Nevertheless she was able in the time at her disposal to learn much of the nomad Lapps' system of values; so much so that she writes: "the Lapp culture now survives only in the small districts of Karasjok and Kautokeino in northern Norway, and in the adjoining Karesuendo (*sic*!) district in Sweden." Even the most conservative reindeer-herding Northern Lapp would not exclude his nomadic kinsmen of Enontekiö in Finland.

The book is somewhat marred moreover by the almost invariable mis-spelling of Lappish words (Miss Newhouse's versions conforming to no standard orthography), as well as by often entirely erroneous translations. Thus "*Ibmel âdde*" ("May God give [it]!") becomes "*Ib mu ladi*" which she translates "May it be the same with you," whilst her *čuove* (*cf. čoar've*, reindeer-horn) is rendered "a grey reindeer with branching antlers." Neither does one expect an anthropologist to call ox-reindeer "stags" nor a trained geographer to write "fjiord."

But apart from such inexactitudes Miss Newhouse combines a vivid descriptive pen, supplemented by several fine photographs, with some shrewd observations. So shrewd perhaps that her successors will regret the precise identification of individuals engaged in illegal fishing and reindeer theft as well as the reflections on certain named persons' chastity and honesty, which the Lapps, who have a habit of obtaining translations of accounts of themselves, may resent as ungrateful, and thereby refuse similar help to following scientists and travellers. I. R. W.

LA LOMELLINA: profilo geographico. By PIERO LANDINI. *Rome: Angelo Signorelli*, 1952. $9\frac{3}{4} \times 7$ *inches;* 226 *pages; maps and illustrations; L.*1600

This little book is a useful addition to the growing body of small regional monographs written by Italian geographers about their own country. It is concerned with the small district of Lomellina, lying in the angle between the Po, the Ticino and the Sesia. It is an interesting study of a sample of the lower part of the North Italian Plain. Special attention is paid to the population, particularly to the distribution of settlements. A clear correlation exists between nucleated settlement and small medium land-holding, and between dispersed settlement and large landed property. As would be expected, the account of the agriculture occupies a large share of the volume, and continuous attention is paid to the historical evolution of the economy.

The book is marred only by some poor, small maps, and indifferently produced photographs. The maps would have been better distributed through the text, but on a larger scale. A. F. M.

MAPS AND POLITICS: A review of the ethnographic cartography of Macedonia. By H. R. WILKINSON. *Liverpool: University Press*, 1951. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* xvi + 360 *pages; maps and diagrams.* 25*s*

This well-produced monograph on the ethnographic maps of Macedonia is a valuable addition to the University of Liverpool Studies in Geography. It describes in some detail all the more important ethnographic maps of Macedonia which have been produced in the last two centuries. The sensitivity of the ethnographer to politics is well brought out by Mr. Wilkinson, who presents a full and absorbing historical account of how the distribution of the ethnic groups of Macedonia has changed according to the whims or prejudices of the ethnographers, most of them showing a strong bias in favour of one ethnic group or another. The marked diversity of opinion on the distribution of the main ethnic groups—Turkish, Greek, Serb, Bulgarian, Macedo-Slav, Vlach and Albanian—is, of course, not solely due to the influence of politics. Some of the map compilers were blandly ignorant of Balkan ethnography, others used too small a scale map to plot the complex distributions effectively, and, more important still, many of the maps were compiled from different criteria. Of these, language, religion, historical association and common customs have had their advocates. If language has been the most generally adopted criteria, ethnographers have however differed considerably on the linguistic distribution in Macedonia, especially on the affinities of the Macedonian dialect with Serb and Bulgar. Mr. Wilkinson rightly stresses that, since there are so great differences between the ethnographic maps of Macedonia, none should be studied out of its historical context. That many of these maps have had a powerful influence on Balkan history is clear, however ineffectual the attempts may have been to plot the ethnic groups; among the most influential have been those compiled by H. Kiepert (1876), G. Weigand (1895) and J. Cvijić (1906, 1909, 1913, 1918). Mr. Wilkinson lists 216 ethnographic maps in his bibliography, arranged in chronological order, and of these, 168 have been published since 1900.

One of the most interesting and valuable features of this book is the use of a series of maps on several folding pages to illustrate the differing views on the distribution of the ethnic groups. The study of these is rewarding in itself, since they show so clearly how wide the disagreements are. In addition, the text is amply illustrated by numerous ethnographic maps based on the originals.

Both the text and maps are well printed and the binding is substantial. There is an attractive coloured frontispiece showing Macedonian peasants from Kumanovo, *c.* 1870. J. C. S.

THE WEST EUROPEAN CITY: a geographical interpretation. By R. E. DICKINSON. *London: Routledge and Kegan Paul*, 1951. $8\frac{3}{4} \times 5\frac{1}{2}$ *inches;* xviii + 580 *pages; maps, plans and illustrations.* 42*s*

This book is an interesting, valuable and wide-embracing collection of information on the growth and structure of the West European City. In a sense, a brief review ought to stop there, for there is no short means of describing its contents. As the author explains in the Preface, "the work is based on material drawn from a great variety of sources and on visits to numerous towns during the 'thirties." This material was ready in 1939, but publication was delayed until after the end of the war. The volume as published forms a most useful reference book containing plans and descriptions of a great many towns of all kinds and discussions on methodology, with a valuable bibliography, and it is also pleasant to dip into at random for much informative reading. But not only is its English style not particularly easy but its arrangement is so difficult

to understand that one is almost tempted to say that there just is no arrangement. In spite of these drawbacks it fills an important gap in geographical literature, and certainly no geographical or town planning library should be without it.

F. H. W. G

AFRICA

THE NILE.[1] By H. E. HURST. *London: Constable*, 1952. $8\frac{1}{2} \times 5\frac{1}{4}$ *inches;* xv+326 *pages; maps, illustrations and diagrams.* 30*s*

Of the very few who are privileged and able to see the Nile and its basin in focus, none is better qualified to write a comprehensive and popular book on the Nile than Dr. Hurst, the former Director-General of the Egyptian Physical Service (now called "Nile Control"), and still scientific consultant to the Egyptian Ministry of Public Works. It is to the credit of the then Minister, Osman Muharram, that, in the face of the general anti-British clamour at the end of 1951, he insisted on retaining the services of Dr. Hurst and three British colleagues at a moment when all other British advisers and teachers were abruptly dismissed.

Dr. Hurst is already the chief author, with various collaborators, of the official textbook in eight volumes on the "Nile Basin." For experts, that is an indispensable work of reference; for the ordinary reader, here is an entirely accurate and, save for the most recent political changes, quite up-to-date account of the various tributaries that unite to make up the Nile, of the lands on their banks and something of the people who inhabit those lands.

As Dr. Hurst says, ". . . there is no great river in the world upon which such an accurate and extensive system of measurement is carried out. . . . Each day the river level is observed at a hundred points in its basin and several times a month the quantity of water flowing is measured at a hundred gauging stations." Until now the control of the river has been a year-by-year affair; the water of the autumn flood being stored in the Aswan Reservoir for release in the low water stage of the following summer. But the time has come for a more far-sighted view of the potentialities of storage. Egypt, and to a lesser degree, the Sudan, is faced with a very alarming future. Her population has doubled in the last half-century and is likely to double again in the next. To meet the increasing demand for food and cotton to buy food with, it is only possible to increase the area under cultivation in Egypt by, at most, 25 per cent. Again, though in an average year, the water used is only about *half* the flow, it must not be assumed that, in a very low year like 1913–14 with a discharge of half the average, the *whole* flow will be available for irrigation. For, if not stored, much water will escape to the sea with the flood. Even if stored, much will evaporate. Dr. Hurst comments: "It cannot be said too often that, without overyear storage, there will, sooner or later, be a disaster."

To meet the danger, Dr. Hurst and his colleagues have put forward the following scheme of projects and it has been accepted so far as Egyptian Government policy is concerned. 1. A large reservoir in Lake Victoria, controlled by the dam now under construction at Owen Falls, which will form the main reservoir for overyear storage. 2. An auxiliary regulating barrage downstream of Lake Kioga. 3. A reservoir in Lake Albert to control water from the Semliki and possible floods from Lake Kioga. 4. In the Sudan the Jonglei Diversion Canal will be cut to prevent water entering the swamps of the Sudd region where it would be lost by evaporation. Thus the Lake Albert water would pass with a normal loss instead of one of 50 per cent. as at present. 5.

[1] *Cf.* "The Equatorial Nile project and its effects in the Sudan," p. 33.

When agreement is reached with Ethiopia, a dam will be built at the outlet from Lake Tana which could provide water for increase of cultivation in the Sudan, some overyear storage and a reserve in case of another disastrously low year such as that of 1913–14. 6. A Fourth Cataract Dam to provide a reservoir for flood protection and store water from all floods except the very low ones. 7. A flood protection reservoir in the Wadi Rayan. 8. There is a hydro-electric scheme still under consideration for the outflow from the Aswan Dam. Any of the dams mentioned above are also sites for possible hydro-electric schemes.

The author does not claim that the projected reservoirs can do more than alleviate the coming food shortages in Egypt. When all the projects are accomplished and the cultivated area increased by 25 per cent., there will still be double the present population wanting to live off it.

One very interesting phenomenon is mentioned by Dr. Hurst (page 272). When the Blue Nile is in flood, sudden flushes travel down to Khartoum and on down the main Nile. That is normal; but about 220 cases have been recorded of these flushes travelling back *up* the White Nile from Khartoum to Dueim and even to Rabak, 220 miles upstream from Khartoum. Curiously, too, the velocity up the White Nile of such a flush was the same as that down the Blue Nile, about 75 miles a day. Of course, no actual water is transferred by such a flush, the wave goes down one river and up the other as it might through a carpet.

As a serving official, Dr. Hurst confines his theme to the engineering side of the problem. But, though the Nile Basin is certainly a hydrological unity, it is far from being a political one. Egypt, the Sudan, Ethiopia, Uganda and the Belgian Congo are all, in different degrees, concerned in these projected regulatings of the Nile water. Nor is the continuation of a settled Government policy to be regarded as a certainty in any or all of them.

On the military aspect, Dr. Hurst is silent. Yet, the Egypt of two generations hence with her doubled population dependent upon these very vulnerable dams will have to look to their safety. Enemy occupation of the dams at the First or Fourth Cataracts might hold up the whole summer flow of the Nile for weeks.

G. W. M

KHARGA OASIS IN PREHISTORY. By G. CATON-THOMPSON. *London: University of London, Athlone Press*, 1952. $12\frac{1}{2} \times 9\frac{1}{2}$ *inches;* xx+213 *pages; maps and diagrams.* 70*s*

Miss Caton-Thompson deserves congratulations and thanks from all interested in prehistory for this magnificently detailed account of three seasons' work in Kharga. Ammunition is thereby provided for innumerable lines of research and argument. In her review of climatic changes, two pluvial periods are recognized; one of great antiquity, an erosional phase during which wide valleys were cut; the other, of slighter rainfall, continuing from Upper Acheulian to Neolithic times. The author refuses to speculate about the age of Pluvial I, but tentatively equates the arid phase separating the two with the Riss-Wurm interglaciation. Since Pluvial II, there has been little or no change in the relief of the oasis floor; for late Middle Palaeolithic industries have been discovered lying round mound springs in the lowest areas of the depression. Miss Caton-Thompson now divides the "Pre-Sebilian" of her article in *Man* (1932) 158, into "Levalloiso-Khargan" and "Khargan." The chronological succession is not quite certain, but the latter possibly gave way to an intrusive "Aterian" from farther west, with an origin perhaps in the Atlas. In this "Khargan" she sees an analogy with the "Sebilian" of the Nile Valley, in that both were strongly marked independent local industries and, rather daringly, comments, "in them we may

discern the origins of Predynastic dyarchy and the beginnings of the strongly local flavour of the tribal and religious systems of pre-Menic civilization."

To the Khargan succeeded two cultures: the Capso-Tardenoisian, now renamed the "Bedouin Microlithic," of the Plateau; and the "Peasant Neolithic" of the mound springs in the depression itself. These latter she identifies with the "Early Oasis Dwellers" of the late Dr. Hans Winkler. Contrary to Dr. Huzayyin's theory of a Nile Valley origin for these neolithic people, Miss Caton-Thompson considers that such parallels as exist between their sites and those at Armant and elsewhere in the Nile Valley are more probably due to emigrants from Kharga being driven by increasing desiccation into the Valley. All the evidence is set forth in this excellently printed and illustrated volume.

On page 35, the allusion to "well-known *tectonic* depressions such as Natrun, Terfawi, Selima and Laqiya" is rather surprising. In default of definite evidence, might not their origin be due to simple erosion along dip slopes? On page 50, the author quotes the inscription on the mason's gad found at the Chephren Quarries "Kamu; bow watch; Southern Libyans" as evidence of the presence there of Temehu. But the word on the gad translated by Alan Rowe as "Southern Libyans" was THNW, a race usually regarded as living in the north. To conclude, the book is indispensable to students of the past climate and the prehistory of the Libyan Desert. G. W. M.

ARABIAN JUBILEE. By H. St.J. B. Philby. *London: Robert Hale*, 1952. 9×6 *inches;* xiv+280 *pages; maps and illustrations.* 30*s*

Of his many published works this is one of those rare exceptions which display virtually nothing of Philby's dominant interest; the exploration (in its widest terms) of the Arabian peninsula. As a biography it does not fall within the familiar type of the careful and considered study of a public figure, nor yet has it the oily smoothness of an official portrait. One feels that extracts from an almost embarrassingly copious material have been thrown together to form an impression of Ibn Sa'ud, but a critical assessment of the monarch and his works is not attempted. Its heterogeneous content appears most clearly when one contrasts the opening chapter which juggles with the numerical values of significant dates in the King's life, after the manner of Arab authors, and the epilogue with its musings on contemporary Sa'ud Arabia and world politics. Philby's authorities for the King's early life comprise a useful list of Arabic manuscript sources, but for more than a quarter-century the book is based mainly on his personal record.

Quite a definite picture of King Ibn Sa'ud does emerge from Philby's pages, though the outline may be blurred here and there; pointers to his foibles are not lacking though his weaknesses are respectfully delineated. Philby is not uncritical of his character and policies, avowed champion of Ibn Sa'ud as he is. It is evident that the King has never really been able to grapple with the problem of the proper financing of a state with even so small a budget as prewar Arabia. His brilliance in Arabian politics and the management of tribal affairs is counterbalanced by his uncertain approach to some wider issues. Like his subjects he is completely at a loss to deal with a problem which might well defeat those in the western world best equipped to face it—the consequences, social and economic, of the eruption of a great oil company into patriarchal Arabia, and the pouring of untold wealth into the public purse.

The general lines of Ibn Sa'ud's life are of course already known to us, but it is Philby's criticisms and underlinings, the interpretation of Sa'udian motives, and the sidelights on court politics that tell us best what lies behind the façade. From an historical angle, the appendices on the ramifications of the Sa'udi and

Sadairi families are of lasting importance: the collection of such data must have been a formidable task.

Though Philby is not alone in his opinions of the late King 'Abdullah of Jordan, one of the chief obstacles to the successful working of the Arab League, the attack on him is personal and bitter. It is evident that Philby has little sympathy for the claims of the Prophet's "Family" which has won the hearts of so many generations of Muslims. In this he no doubt reflects the feelings of the Sa'udis themselves; but these pretensions were probably not extravagant for his generation; it only happened that that generation's pretensions were somewhat outmoded when 'Abdullah's Memoirs appeared. The reviewer can however endorse what Philby says of the bowdlerized and inaccurate version of the Memoirs as they appear in the English translation.

It is difficult to conceive how Philby could have hoped that the plan for Palestine which he devised and outlined to the late Dr. Weizmann could possibly have proved acceptable to any Arab. In brief this plan visualized abandoning Palestine to the Zionists and the re-settlement of the displaced Palestinian Arabs, at the expense of the Jews, in the sister Arab countries. Ibn Sa'ud was to receive a handsome sum to cover expenses. Certainly Philby emphasizes that the Jews, in his opinion, have no moral or legal right to go to Palestine, and the plan was to be one of expediency only. Proposals so counter to fundamental Arab and Muslim sentiment, despite the sad venality of many Arab leaders, could certainly not be openly sustained by them, and Ibn Sa'ud's rejection of the plan is only surprising in that it did not come sooner. Nor is the defence of Ibn Sa'ud's lukewarm Palestine policy convincing. The bargaining power with America which Arabian oil placed in his hands—to save Palestine by diplomacy—bears a strong resemblance to the cards which Dr. Mousaddeq has played with such conspicuous success in Persia. Had the comfortable flow of gold already corrupted Sa'udi Arabian resolution, or was the King simply unable to play his hand?

Of one thing we can be certain; the story of Sa'udi Arabia and its bewildered king is hardly to be seen only in the mellow light of achievement which Philby sheds around it. Change is inevitable, and where an adjustment takes place in the way it has done in the Sudan no one is the worse, but sudden exploitation of mineral wealth on a vast scale in Arabia, unless adequately controlled, may well prove ultimately more of a tragedy than a benefit. R. B. S.

AMERICA

INDIANS OF THE ANDES: Aymaras and Quechuas. By Dr. H. Osborne. *London: Routledge and Kegan Paul*, 1952. $8\frac{3}{4} \times 5\frac{1}{2}$ *inches;* xiii+266 *pages; maps and illustrations.* 25*s*

This volume summarizes some aspects of the history of the Quechua and Aymara Indians, who formed the nucleus of the Inca Empire. The story is carried from remote origins to the present day.

The treatment lacks focus and definition. The environments are inadequately described and the archaeological evidence is given in an incomplete and confused form. Dr. Osborne shows skill in his handling of Indian myth and legend concerning their origins, but by devoting so many pages to them and yet ignoring important archaeological evidence such as the recent discoveries by Dr. Junius Bird, he makes his account of origins distinctly flimsy.

We are told that the Incas "were living in their Bronze Age when Pizarro burst disastrously upon them and to-day they are still living to all intents and purposes in an Age of Bronze." How did they make bronze and into what

instruments did they fashion it? What were the effects of the Spanish introduction of iron? The present-day Indians use mainly wood and iron; in exactly what sense can they be said to be still in a Bronze Age? It may not be possible to give a full answer to these questions, but Dr. Osborne does not even ask them. Yet he devotes some ten pages to the *quipu*. The same lack of proportion and attack shows in his treatment of agriculture.

There is a clear description of Inca society and its religion, but the account of the Spanish impact and the new colonial society is written in too generalized a form. The Inca civilization is regarded as superior to the Colonial; this is a possible view, but one would welcome more definite material on which to judge. Population changes should be discussed at much greater length, even if the material is unsatisfactory; the effects of the new diseases introduced by the Spaniards are not described. It is also important to explain precisely why the Indians benefited so little from the new crops, animals and techniques introduced by their conquerors. This question is not really faced. "The civilization which the white does not want to offer the red is unwilling to receive." But does history suggest that people always get what they want?

There are some vivid and forceful pages on the modern Indians. The generalizations would however be much strengthened by short studies of particular mines, villages and urban areas, so that we could form a more exact idea of the relative importance of exchange and subsistence elements in their economies.

The spelling of Indian names shows inexplicable variations, and in places the style is wordy and confused. To speak of "a polycladous tradition multiradicate in the distant past" is to marry difficult words to simple ideas. There is a considerable number of misprints ("volcanic larva" on page 58 is unfortunate) and the map of Bolivia can only be described as bad. D. M. P.

GENERAL

TIRICH MIR: The Norwegian Himalaya Expedition. Translated by SÖLVI AND RICHARD BATESON. *London: Hodder and Stoughton*, 1952. 8½×5½ *inches; 192 pages; maps and illustrations.* 21*s*

CALL OF THE MOUNTAINS. By COLIN WYATT. *London: Thames and Hudson*, 1952. 12×8½ *inches; 96 pages; illustrations and sketch-maps.* 35*s*

The Norwegian expedition described in this book had chosen a peak of over 26,000 feet as their goal. I suppose that any climber who has been as high as 25,000 feet would regard a peak of 26,000 feet with the greatest respect. Moreover, the difference in height between Tirich Mir and the popular "eight-thousander" is not a difference that counts except on paper. The Norwegian party at any rate showed great good taste in choosing so fine a mountain for their venture.

An excellent feature of the careful organization of the expedition was the provision of medical skill and supplies on a sufficient scale to deal generously with the local inhabitants. The comments by the medical officer are particularly interesting, but surely it is misleading to use the term "altitude deterioration" as it is used on page 161 as a synonym for mountain-sickness. Previous experience on Everest seems to indicate that there are two distinct elements in mountain-sickness: one being a lack of adaptation and the other a progressive physical deterioration, which is liable to attack the acclimatized climber after too long a stay at great heights.

A pertinent comment by the doctor is that radiation *inside* the tents made

spectacles necessary. As a likely cause of frequent headaches on Himalayan peaks it suggests a need for specially darkened tents. A rather alarming statement is that carbon monoxide in dangerous quantity may be generated by the contact of naked flame with cold cooking pans in confined spaces, especially at great heights.

Camp 2, where the climbers took to the glacier, was about 11,000 feet below the top of the mountain. The fact that they successfully reached the summit (one of the party solo) exemplifies the advantage of short distances between numerous camps with a resulting effective acclimatization. They were fortunate in not meeting with bad weather that might have caused long delays at the high camps with danger of disastrous deterioration.

The native porters with at least one most notable exception were evidently less well adapted to the work than are the Sherpas of the eastern Himalaya or the Bhotias of Garhwal, and a porter with hysterics is an unwelcome novelty. The photographs give a good idea of the grandeur of the scenery and of the difficulties encountered. The ascent of this magnificent mountain is a great achievement, and does honour to Norway, a nation that to some extent is a newcomer to the peaks of Asia.

Mr. Wyatt's book is the record of a brilliant photographer and climber; his camera work suggests that of an artist who is a bold and imaginative draughtsman rather than a mere photographer and he uses figures in his well composed landscapes very effectively. He climbs and photographs in Africa, Lapland, Albania, Canada, the North and South Islands of New Zealand, in Australia and in the Alps. In New Zealand and in the Atlas he successfully accomplishes new expeditions. The world traveller who shuns well-trodden peaks will be delighted with his chapters on the Atlas, Albania and Lapland as well as with his descriptions of the volcanoes of North Island. In a more popular range of mountains his camera achieves an almost new and very imposing aspect of that much photographed peak of the Rockies, Mount Temple. It would be interesting to see what this skilful photographer could make of the high Dauphiny landscapes, crowded as they are with rock and ice mountains of every degree of steepness and shapeliness.

Much of the author's mountaineering has been in winter and he is an accomplished skier. It surprised the reviewer to learn that the area under winter snow in the south-east corner of Australia is very nearly equal to that of the Alps of Switzerland in winter, and that the Kiandra Ski-club was "founded in 1861," sixteen years before the Norwegian ski-club in Christiania.

The type and arrangement of margins in this book are admirable, the chapter-headings are an original conception charmingly executed, and the whole is pleasant to read and beautiful to look at. C. F. M.

AGRICULTURAL ORIGINS AND DISPERSALS. Bowman Memorial Lectures, Series 2. By CARL O. SAUER. *New York: The American Geographical Society*, 1952. 9×6 *inches;* v+110 *pages; maps.* $4.00

LAND FOR TOMORROW. By L. DUDLEY STAMP. *Indiana University Press*, 1952. 8×5 *inches;* 230 *pages; maps and diagrams.* $4.00

These two books both contain series of lectures recently delivered in the United States; those of Dr. Carl Sauer in New York City, and those of Professor Stamp—as Visiting Professor for the Patten Foundation—at Indiana University. The courses were fundamentally alike in dealing with Land Use, but whereas Dr. Sauer looks back into the past, seeking the origin of food production, Professor Stamp is concerned with the present and with the future.

Both writers agree in emphasizing the fact that we have too little knowledge

to give decisive answers to such questions as how and where man first began to cultivate the soil, or how he will meet the present-day crisis of the insufficiency of food crops to banish hunger. As to the cradle of earliest agriculture, Carl Sauer adduces evidence in favour of South-eastern Asia, a region of high physical and organic diversity, rich in plants capable of cultivation. In the New World he finds a similar "hearth" in the north-west of South America, and from each he indicates directions of spread. South-eastern Asia also provided the original pig, dog and fowl, all of them household and not herd animals, first domesticated as pets or for ritual purposes, rather than for economic reasons. The seed reproduction of plants and the keeping of flocks are alike considered to be later developments. The author's general conclusions are summarized in four excellent coloured maps, described as "work sheets to be revised as better knowledge comes to hand."

Professor Stamp gave his hearers an abundance of up-to-date statistics, and emphasized the fact that many of the confident estimates made in the nineteen-thirties of coming population declines among western peoples have proved wide of the mark. Nor should we seek first of all for underdeveloped lands in distant corners of the earth, nor even in the tropics. The middle temperate lands—the United States, Canada, Argentine, Australia—are still underdeveloped according to the figures available of output per acre of actually cultivated land. The world story is, in fact, basically the same story as we are now being told about our own islands. Bring the productivity of the less efficiently run farms—the B and C types—up to that of the first class or A types, and total output might be stepped up perhaps 50 per cent. or more. Canada's immense total wheat yield, when translated into bushels per acre, is well below the world average, and less than half that obtained in Great Britain, while the productivity of the land in India and Pakistan, whatever the crop, is shown as pathetically low.

Even with our present acreage of cultivation, and our present knowledge of farm methods, Professor Stamp estimates that with all-over efficiency we could support a population of three thousand millions, while if underdeveloped or undeveloped land were brought under cultivation the figure might be ten thousand million. And meanwhile science is adding constantly to the sum of human knowledge, so that "if only man can overcome the barriers he himself has erected between the nations" there might be no hunger problems at all.

E. G. R. T.

MIRROR TO RUSSIA. By MARIE NOËLE KELLY. *London: Country Life, Ltd.*, 1952. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 248 pages; maps and illustrations.* 21*s*

AMBASSADOR'S WIFE. By E. CERRUTI. *London: George Allen and Unwin*, 1952. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 255 pages.* 18*s*

A FORGOTTEN JOURNEY. By PETER FLEMING. *London: Rupert Hart-Davis*, 1952. $7\frac{1}{2} \times 5$ *inches; 190 pages; maps and illustrations.* 10*s* 6*d*

Books about Communist Russia are as a rule so heavily biased in one political direction or the other that Lady Kelly's 'Mirror to Russia' comes as a refreshing relief from politics and prejudice.

She spent two years in Moscow as wife of the British Ambassador there, and during those two years (1949–51) she managed to visit a surprising number of places, from small, little-known monasteries near the capital to remote, normally inaccessible towns such as Odessa and Tiflis. Lady Kelly maintains that "with persistence and effort the great majority of the historic and artistic localities in European Russia could be visited," but one feels that the sincere

and unbiased interest she showed in all artistic and architectural subjects must have influenced the authorities in her favour.

As a result of the unusual freedom of movement allowed to Sir David and Lady Kelly, she is able to write a book of particular value to those interested in the ancient churches and monasteries of Russia. Her knowledge and observation is of a high quality, and this book is of great general interest as a vivid, sensitive, uncontroversial account of the always intriguing Russian scene.

She describes with feeling the lonely "primeval" countryside; she accepts with humour the ever-present bodyguard, and the often primitive discomforts of travel in Russia; she delights in the excellence of the ballet, of which she shows considerable understanding; she reveals a sense of regret at certain aspects of Communist rule and way of living, but quietly avoids controversy and censure. By her own obvious enthusiasm and appreciation of so much that is beautiful and historically interesting, she gives the reader a book of great sincerity and fascination. The photographs are excellent.

Another Ambassador's wife to write her experiences is Madame Cerruti, whose husband was at one time Italian Ambassador to a variety of countries including China, Russia, Nazi Germany and France. Madame Cerruti's account in 'Ambassador's Wife' covers a much longer period than that of Lady Kelly, beginning with her first experiences as an Ambassadress in Peking in 1923 and ending with her husband's recall to Italy in 1937, when his markedly anti-Nazi attitude displeased Mussolini. Her memories are of people rather than places and the main interest of the book is her descriptions of such characters as Hitler, Goering, Mussolini and many others whom she met in her official capacity.

Madame Cerruti has very obvious charm and many talents; one feels she added greatly to the success of her husband's many official functions, but one does not feel that her character-drawing is sufficiently unbiased or balanced to be really valuable as a judgement.

Peter Fleming's 'A forgotten journey' is the account, in diary form, of a journey made in 1934, which he had literally forgotten. Recently he found this diary and after a little pruning and the addition of a few footnotes, it is published in its original form. This does not make smooth reading; it is inevitably a cryptic, jerky account. But it has much of the author's usual wit and delicious humour, and of course has the merit of showing his immediate reactions to people and places and events.

He journeyed (and never without the inevitable restrictions and difficulties) from Moscow via Askabad and Sarmarkand, across Central Asia to Manchukuo (then under Japanese domination); he visited Vladivostok and Mukden among other places, and so down to Peking and Central China.

Although any account of such inaccessible places is intriguing and Mr. Fleming manages to convey the inconsequent fantasy, the irritation, the dirt, the discomfort and the fascination of travel in these remote countries, one is left a little disappointed by the lightness of the account. With such exciting and original material one wishes to know so much more about Mr. Fleming's journey, the people he met, the cities he visited, the conditions he suffered and the things he appreciated c.: enjoyed. D. K. S.

SIR JOSEPH BANKS, K.B., P.R.S.: the autocrat of the philosophers. By HECTOR CHARLES CAMERON. *London: Batchworth Press*, 1952. $8\frac{3}{4} \times 5\frac{1}{2}$ *inches;* xx + 342 *pages; illustrations.* 25*s*

For reasons fully explained by Mr. Cameron, no full and authoritative life of Sir Joseph Banks has yet been written—a somewhat surprising fact in view of

his important position in the world of his day. Banks made his main contribution through inspiring, assisting and encouraging the work of others. He wrote very little himself for publication; perhaps his best-known work is his Journal of his voyage with Captain Cook in 1769–71, and this was not printed until 1896. Through a series of unfortunate events, his voluminous collection of correspondence and memoranda have been dispersed among libraries in many parts of the world. These circumstances have deterred would-be biographers in the past. As a consequence of this lack of an adequate study, his reputation has suffered considerably from the opinions of certain contemporaries, some with personal reasons for hostility. These included John Wolcot ('Peter Pinder'), James Gilroy the cartoonist, Bishop Horsley, one-time Secretary of the Royal Society, and to some extent Horace Walpole. One charge arose from the fact that at a time of high anti-French feeling, Sir Joseph insisted on distinguishing between French men of science and the revolutionaries.

Mr. Cameron, without attempting a full length biography, has done much to clear up obscurities in Banks's career, and to present a balanced view of his achievements and character. He shows for example that most of the details of Banks's early career were drawn from the little known Hunterian oration by Sir Everard Home in 1822, which is reprinted in full as an appendix. His access to the Banks manuscripts in the Royal Society has enabled him to present Banks's career as President of the Royal Society in a favourable light. Far from being "a man intolerant of advice, haughty, vainglorious, and not a little puffed up by the honours which he received" from King George III, he is represented as putting his own views strongly, but only after careful and patient consideration, as good-humouredly tolerant of opposition, and ready, if occasion arose, to admit a mistake. Mr. Cameron has also found documents illuminating the breakdown of the arrangements for Banks to sail on Cook's second voyage (see this *Journal*, Sept. (1950) 49) and prints other unpublished material, mainly bearing on his family connections. Adequate and carefully documented accounts are given of the various aspects of his life, as voyager, botanist, President of the Royal Society, Commissioner of the Board of Longitude, and a founder of Australia. These chapters, despite the great amount of detail they contain, are instructive and pleasant reading, enlivened by the author's dry humour. Together they present a remarkable panorama of a period rich in scientific activities in many directions.

In the past, full justice has been done only to Banks's part in the early history of Australia, and a final judgement must await the publication of his papers. It would however be surprising if the main lines of Mr. Cameron's study should require substantial amendment. G. R. C.

HANS EGEDE: colonizer and missionary of Greenland. By Louis Bobé. *Copenhagen: Rosenkilde and Bagger*, 1952. $10\frac{1}{2} \times 7\frac{1}{4}$ *inches;* 207 *pages; map and illustrations.* 26*s*

It would be difficult to imagine a stranger contrast in forms of European colonization than that presented by the settlement of the west coast of Greenland by Scandinavian Vikings in the tenth century and by Danish (and German) missionaries and traders in the eighteenth. Hans Egede, with his university degree in theology (albeit *mediocrem*), his business acumen, and his taste for what would be known to-day as "alchemical research" may have been a less full-blooded colonizer and explorer than the pagan outlaw Eric the Red, but he had an incomparably more difficult task.

Until 1945, when the late Dr. Bobé's monograph was published in Danish (*Meddelelser om Grønland*, Bd. 129, 1, 1944), there was no properly balanced

account of Egede's life. Many of his letters and reports were burnt in the fire which destroyed the Mission College at Copenhagen in 1795, and students of the history of Greenland are much indebted to Bobé for unearthing a great mass of hitherto unused material in archives at Bergen, Herrnhut and Copenhagen. Perhaps the most important new evidence relates to the events of 1731, when Christian VI of Denmark withdrew the incredibly inefficient army garrison and the future of the Danish settlement hung in the balance. Bobé shows that the king's decision to continue to support the mission and to help finance a private trading company was due not to the personal influence of Count Zinzendorf, the founder of the Moravian Brethren, but to the strong representations of Egede in the autumn of that year.

It is unlikely that more information about Egede's life and work will come to light and it seems regrettable that the English translation should have been abbreviated by the omission of all the notes and references of the original, as well as details such as those relating to the history of the Bergen trading company, the genealogy of Egede's family, and the visit of the Greenlanders Poek and Keperok (why not K'iperok, the name given in *Meddelelser*?) to Denmark in 1726. These interesting visitors took part in a regatta at Christiansborg Castle "from their kayaks flinging darts after ducks, which for that very purpose had been put out in the canals," to the great diversion of the court and the citizens of Copenhagen, and consequent benefit of the Greenland trade. On the other hand the narrative is rambling and diffuse, and the value of the book would have been considerably increased by rigorous editing (of the plodding English translation at least). Modesty is certainly becoming to a writer, but surely it is necessary for a historian to use his knowledge and experience to interpret facts as well as to recount them without comment. The author's unrivalled knowledge of his subject entitled him to express opinions about the events which he relates, and the absence of them is a definite loss to the reader.

J. D. M. B.

CHARLES STURT: his life and journeys of exploration. By J. H. L. CUMPSTON. *Melbourne: Georgian House*, 1951. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* xii+196 *pages; illustrations and sketch-maps.* 21*s*

Dr. J. H. L. Cumpston (not to be confused with Mr. J. S. Cumpston, part-author of the 'Handbook and index to accompany a map of Antarctica' published in Australia in 1939) served the Commonwealth of Australia with distinction as Director General of Health from 1922 to 1945, and justly earned his high reputation as an authority on the history of disease in Australia and the Pacific. When his book on Sturt was announced I took it for granted that he would produce an imposing work. Unfortunately it proves to be mediocre in scholarship, writing and production. In spite of a disarming preface in which he explains that he adds very little to our knowledge of Sturt, and an introduction in which he apologizes for his maps, it is difficult to decide what real purpose his book serves. The best way for Australia to serve Sturt would be to publish a properly edited edition of Sturt's own works and to keep them in print: procedure for which the Hakluyt Society has set numerous examples. Most of the maps in Dr. Cumpston's book bear no indication of scale or direction; his illustrations bear no numbers and are nowhere properly related to the text; and there are no less than four appendices to interrupt reading. Dr. Cumpston repeatedly makes such statements as "They must have passed through Binnera Downs, Naryilco and Yanko stations; . . ." whereas they did nothing of the kind, as the stations were not then there. It is beside the point to excuse such writing by saying "But you know exactly what I mean!" The

third paragraph on page 134 is ungrammatical. There is frequent reference in the book to the Royal Historical Society and Royal Geographical Society; but the latter proves to be the South Australian Branch of the Royal Geographical Society *of Australasia*, and what historical society is meant is not immediately clear. To the Royal Geographical Society itself there is hardly any reference, yet the indexes to our earlier publications bristle with references to Sturt. Neglect of the Society's record has led Dr. Cumpston to at least one false conclusion. The supposed waning and abandonment of Sturt's belief in the existence of an Australian inland sea is one of the themes of the book; but Sturt's own words, when addressing the Society on 14 March 1859 (*Proc. R.G.S.* 3 (1859) 155–58) show that he never really gave up the belief. Sturt's original account of the expedition of 1844–46, which appeared in the neglected but important *Tasmanian Journal of Natural Science* (vol. 3) has been overlooked. Dr. Cumpston identifies the seeds of *Mesembryanthemum* with "nardoo," used by the Australian aborigines as food. According to *The Australian Encyclopaedia* nardoo is the "clover" fern (*Marsilea Drummondi*), and the plant once cultivated as nardoo by Griffith Taylor in the Geographical Department of the University of Sydney was certainly not a *Mesembryanthemum*. Of Sturt's relations with the Linnean Society Dr. Cumpston has nothing to say. His book does however add in detail to our knowledge of Sturt's personal affairs, and relates his itineraries, though rather unsatisfactorily, to modern maps. It will take a place in our assessment of Sturt's performance, on account of Dr. Cumpston's medical insight and his clinical attitude towards the expeditions; but his positive contribution might have been better in the form of one or two papers for the learned societies. The volume itself is undistinguished in typography and binding, has no index and is expensive for its quality. M. A.

AN EXPLORER-SCIENTIST'S PILGRIMAGE: The autobiography of William Herbert Hobbs. *Michigan: Ann Arbor, J. W. Edwards, Inc.*, 1952 $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 222 pages; illustrations.* $3.75

The late William Herbert Hobbs, Professor of Geology at the University of Michigan from 1906 to 1934, published his autobiography in his eighty-ninth year, shortly before his death. He looks back at the major events in his astonishingly full and active life: his geological studies in America, Europe and the Pacific islands, his expeditions to Greenland (undertaken when he was over sixty), his attendance at countless international scientific gatherings. The book is for the general rather than the scientific reader, and should therefore be judged on its general merits as an autobiography. These, however much we may admire Professor Hobb's enormous energy, are not overwhelming. The book is repetitious and so full of the (no doubt well merited) honours and awards bestowed upon its author that the reader fears the main purpose of the book may have been thus to dazzle. The writer of a good autobiography will make us find it entirely natural that he should know the great men of his day; he does not bludgeon us into accepting this fact by drawing up a list of "world figures" known to him, neatly divided into those who were house guests and those who were not. Of course this is an old problem: how is the autobiographer to avoid seeming to blow his own trumpet when blow it he inevitably must? It has been solved in many ways, but not this one.

Professor Hobbs will be familiar to many readers of the *Geographical Journal* as the central figure of various controversies: for instance, the dispute as to whether Palmer or Bransfield discovered Antarctica, and the theory of the "glacial anticyclone." These topics find their place here, but the battle is not joined again. After all, the general reader cannot be expected to examine all the evidence; but he is firmly given the impression that the battle has in all cases

ended in victory for Professor Hobbs. Some indication to the reader that there is another side to these, and other questions might have improved the book considerably. T. E. A.

SOME RECENT TRAVEL BOOKS

The modern travel book has itself travelled a long way from the formal diary of an eighteenth century gentleman on the Grand Tour and from the later compendium of information which Baedeker made famous. Perhaps the fashion for discursive, individual travellers' tales began with R. L. Stevenson, and it may be more than a coincidence that Mr. Anthony Rhodes chose to visit Rome in Holy Year on the back of a donkey. A SABINE JOURNEY (*Putnam's*, 18*s*) is an entertaining book; the author is in love with Italy and this love lends a warmth and liveliness to an account not otherwise particularly original or arresting. Mr. Rhodes is a romantic, constantly dashed by the contrast between his ideal Italy and the reality which, as an Anglo-Saxon brought up to honesty, cleanliness and the austerities of Protestantism, he cannot but observe and often deplore.

Mr. Rhodes is something of a *poseur* and might not wish to ride upon an ass again; Mr. Tschiffeley is a practical man and would continue to use, whenever suitable, the motor bicycle on which he toured Spain. Perhaps this is why ROUND ABOUT SPAIN (*Hodder and Stoughton*, 20*s*) is a less attractive book than A SABINE JOURNEY, and will be a disappointment to those who rode from Southern Cross to Pole Star in imagination with the author. Mr. Tschiffeley understands the Spanish way of life and is interesting on bull-fights, but he seems not to have been really captivated by Spain.

Miss Freda White's THREE RIVERS OF FRANCE (*Faber and Faber*, 25*s*) is a more serious piece of work than either of the foregoing, and one which would be useful as well as pleasant to take on a tour of those south-west districts of France which are watered by the Dordogne, the Lot and the Tarn. Miss White is an excellent guide; her facts are reliable and relevant whether she writes of geology, history or the facilities for tourists, yet she is alive to the charms of the countryside and makes one wish to go there. She does not obtrude her own personality, but allows an occasional glimpse of herself—standing on an old bridge, for instance, to "watch the river currents until you are saturated with pleasure." Miss White is a sober lover, able to equate the real with the ideal in the country of her choice; Eric de Maré, whose SCANDINAVIA (*Batsford*, 21*s*) is another helpful and interesting book for travellers, is hardly a lover at all, so matter-of-fact is he. An architect of Swedish descent, Mr. de Maré is well qualified to describe the splendid buildings of the North, and he is at his best on this subject. His summaries of Scandinavian history have rather a textbook flavour, but he writes with real affection of the natural beauty and attractive domesticity of Norway, Sweden and Denmark. Both Miss White's and Mr. de Maré's books are exceptionally well illustrated, with fine photographs relevant to the text.

All these four books are European in outlook; one moves into a different climate on reading THERE'S ALWAYS ADVENTURE (*George Allen and Unwin*, 18*s*) by Grace Barstow Murphy. The wife of the eminent American ornithologist, Robert Murphy, she has written an autobiography in which she describes her travels in all parts of the world, including a visit to the sub-Antarctic Snares Islands where she stayed with her husband on one of his scientific missions. Mrs. Murphy is a New Englander whose reverence for European antiques and horror of South American sanitation sometimes contrast amusingly with the flippant attitudes of such children of an older culture as Mr. Rhodes and Miss White in similar situations. D. M.

THE SOCIETY'S NEWS

BRITISH MOUNT EVEREST EXPEDITION, 1953

Plans and preparations for the forthcoming assault on Mount Everest have been proceeding fast during the winter. With the cooperation of the Air Ministry and the Indian Air Force, the first consignment of newly designed oxygen equipment will have been flown out to Calcutta by the end of February and thence on to Katmandu. A further load is due to be sent towards the middle of March. The main body of the expedition sailed on February 12, including the leader, Colonel John Hunt. The Himalayan Committee of the Society and of the Alpine Club has decided that if the pre-monsoon assaults on the summit fail, then further attempts after the monsoon will be made by the reserves with some reinforcement from the pre-monsoon party.

The names of the 1953 Everest Expedition team are as follows:—

Colonel John Hunt (leader), Major C. G. Wylie, Mr. G. C. Band, Mr. T. D. Bourdillon, Dr. R. C. Evans, Mr. A. Gregory, Mr. E. P. Hillary, Mr. W. G. Lowe, Mr. W. Noyce, Dr. Michael Ward and Mr. M. H. Westmacott. Dr. L. G. C. E. Pugh will accompany the expedition as physiologist and Mr. Tom Stobart as cameraman.

A photograph of some of the members of the team, taken by *The Times* in the New Map Room, is opposite.

Reading from left to right, standing, Mr. H. A. Rawlinson (reserve), Dr. L. G. C. E. Pugh, Major C. G. Wylie, Mr. C. W. F. Noyce, Mr. G. C. Band, Mr. J. A. Jackson (reserve), Mr. M. Westmacott. Seated, Dr. R. C. Evans, Colonel John Hunt (leader), Mr. T. D. Bourdillon, Mr. A. Gregory.

The new oxygen equipment has been prepared under the supervision of Mr. Peter Lloyd, with the invaluable advice and guidance of a scientific committee under Sir Bryan Matthews, Professor of Experimental Physiology at Cambridge University, working in cooperation with the Medical Research Council. A generous grant of £600 from the Royal Society has enabled Dr. L. G. C. E. Pugh, of the Medical Research Council, to be attached to the expedition as physiologist.

Dispatches from the Expedition will be published in *The Times* and in associated newspapers abroad through the summer and, if a post-monsoon attempt is necessary, during the autumn and early winter.

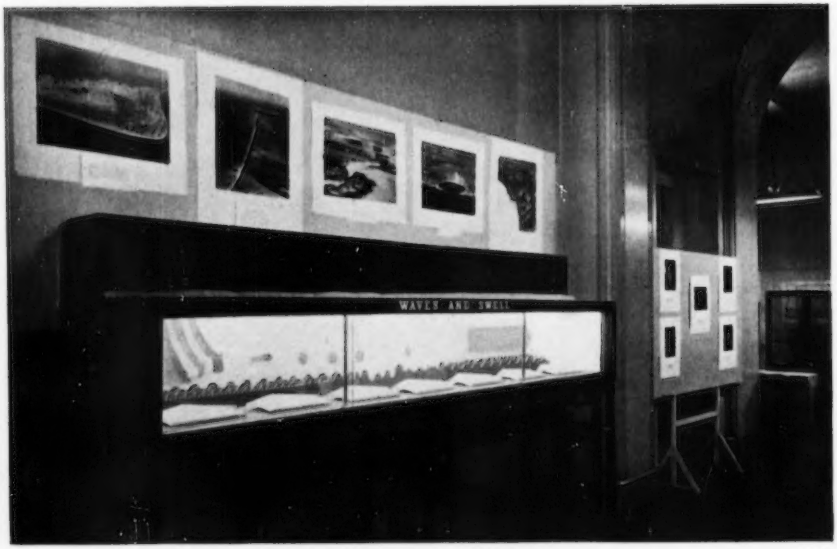
CHRISTMAS MEETINGS FOR CHILDREN AND EXHIBITION

The theme of the two Children's Meetings last Christmas was contained in the title of the Christmas Exhibition, "Exploring the Sea." The first, on December 29, was by Commander G. S. Ritchie, D.S.C., R.N., and was about the Pacific voyage of H.M.S. *Challenger* in 1950, and the second, on New Year's Eve, was a programme of underwater films, including the first underwater colour film, with introduction and commentary by Dr. W. D. Chesterman of the Royal Naval Scientific Service. Requests for tickets were so heavy that both meetings were repeated each afternoon and the combined audiences numbered not far below three thousand.

The Exhibition which was open to Fellows and Associate Members and their guests from December 29 was open to the general public on January 3. In its arrangement and organization as well as in the loan of many of the Exhibits, the Society had the great benefit of the cooperation of the National Institute of

Members of the British Mount Everest Expedition, 1953, with the leader, Colonel John Hunt, front centre. Key to photograph is on opposite page

The Christmas Exhibition, "Exploring the Sea." Plankton recorder to left



The "Moving Ocean," with coastal photographs

Commander G. S. Ritchie, D.S.C., R.N., *demonstrating a Polynesian dance after a Christmas lecture to children*

Oceanography. The Hydrographic Department of the Admiralty, the British Museum (Natural History) and the Institute of Navigation also provided considerable assistance, and exhibits were lent by the Admiralty Research Laboratories, the Departments of Geodesy and Geophysics and of Geography at Cambridge, the National Physical Laboratory and other institutions. The aim was to show how recent scientific developments had greatly increased our knowledge of the underwater world. The exhibits were arranged in three sections corresponding to the three principal fields of oceanographical research and exploration; exploring the sea-bed, life in the sea, and the moving ocean, including winds, waves, tides and currents. The Exhibition, modest as its scale had to be, aroused much public interest and a descriptive broadcast on the Home Service on January 15 caused a considerable increase in the daily attendances, especially among children and young people. Up to January 31, the closing date for the public, 8747 people had visited the Exhibition, of these 4567 being members of the general public. The Exhibition remained open to school parties until February 21, in response to the number of requests from schools.

NEW YEAR'S HONOURS LIST

It was announced in the New Year's Honours List that Brigadier J. C. T. Willis, O.B.E., Director of Military Survey and member of Council of the Society, had been created a C.B.E.

THE RECORD

CONTRIBUTORS TO THIS ISSUE OF THE *JOURNAL*

Dr. D. Thomson, now at the Department of Anthropology in the University of Melbourne, joined one of the first "Independent Companies" (Commando units) in 1941, and in 1943 led a patrol of exploration and forward reconnaissance in Dutch New Guinea. He was awarded the Cuthbert Peek Grant for 1948 and the Patron's Medal for 1951. *Dr. Owen Lattimore* is Director of the Walter Hines Page School for International Relations, and was awarded the Patron's Medal for 1942. *Dr. P. P. Howell* is Chairman of the Jonglei Investigation Team at Malakal, in the Anglo-Egyptian Sudan. *E. J. Wayland* was formerly at the Department of Geological Survey, Lobatsi, Bechuanaland. *N. Hilton* is a member of the Research Group of the Agricultural Land Service in the Ministry of Agriculture and Fisheries. *B. W. Sparks* is University Demonstrator in Geography at Cambridge. *J. N. Jennings* was formerly Lecturer in Geography at University College, Leicester, and is now Reader in Geography at the School of Pacific Studies, Australian National University, Canberra. *J. M. Lambert*, formerly Lecturer in Botany at Westfield College, University of London, is now Research Fellow, Newnham College, Cambridge.

AN EXPEDITION TO NORWAY

A four-man expedition visited Arctic Norway in July 1952, its objective being the northern part of the Lyngen Peninsula in lat. 70 N. The mountainous and much glaciated interior of this Peninsula, 500 square miles in area, seems only to have been roughly mapped by the Norwegians. The party led by George Sutton in 1951 carried their exploration and survey as far north as the

trans-peninsular range of the Vagastinder; the 1952 expedition explored northward from the Vagastinder to the extreme tip of the Peninsula.

The watershed south-east of the Nordlenangen Fjord, with its fine untrodden peaks and glaciers, was made the subject of a detailed plane-table survey, since on existing maps few of the peaks and none of the glaciers are shown and the watershed itself is wrongly placed. A lake about a mile square and four glaciers were discovered here and surveyed, and three virgin peaks (two of them unnamed and one unmapped as well) were climbed. A smaller scale sketch-map of the ranges farther north was made, recording three more unmapped glaciers and correcting a bad error in the mapped position of the main peak, Pipertind (climbed by G. Hastings in 1899).

Norwegian Government surveyors are working on an amended survey of Lyngen, but the new maps examined suggest that no detailed survey of the interior mountains and glaciers is being made, the coastal and easily accessible areas alone receiving attention. The 1952 expedition, which was self-supporting and spent twenty-eight days in the six advanced camps, included Lieutenant-Commander S. Styles (leader), J. H. Welbourn, J. N. Hutchinson (surveyor) and M. J. Barber (geologist). S. S.

THE BRITISH ASSOCIATION MEETING AT BELFAST

Geographers who attended the meeting of the British Association in Belfast, in September 1952, were supplied with an elaborate and scholarly handbook and warmly welcomed by the local geographers and inhabitants of the city. Then they enjoyed a programme full of interest. The Presidential address of Professor A. V. Hill dealt with many topics of particular interest to them. It was followed by seven papers on various aspects of the geography of Ireland. Most of these related to Northern Ireland and supplemented both the handbook and work done on the excursions. The latter, whether in the neighbourhood of Belfast, or farther afield to the Mourne Mountains, Stangford Lough, or the Antrim plateau, were particularly successful. Full of instruction and of interest, they were made all the more enjoyable by weather remarkable for good visibility.

Papers on more general topics began on Friday afternoon, when questions of population in South America and in India were discussed. On Monday Professor R. O. Buchanan, President of the Section, gave his address on "Aspects of settlement in the overseas Dominions." This is printed in full in *The Advancement of Science*, Vol. 10, No. 33. The remainder of the morning was taken up by two papers, the first making use of an early nineteenth century muster list of Craven, and the second applying new statistical material to the output of Scottish coalfields. On Monday afternoon a joint discussion with Section F (Economics) on "The location of industry in Northern Ireland" attracted, as did all papers of local interest, an audience beyond the capacity of the lecture room. On Tuesday morning papers on the Isle of Man, Devon and Calabria maintained the high standard of those already mentioned and the same may be said of those on Wednesday morning which dealt with underfit rivers and towns in south-west Wales.

Inability to be in more than one place at the same time alone prevents one from deriving the maximum benefit from the meetings of the British Association, and as usual there were many papers in other Sections of interest to geographers. Lack of space prevents mention of more than two: Professor Charlesworth's account of "The geology of the Belfast district" to Section C (Geology) and a discussion by geologists, zoologists and botanists on "the Irish fauna and flora."

The success of the meeting would not have been assured without the admirable local arrangements for which the Staff of the Department of Geography of the Queen's University were responsible. To them, and particularly to N. Stephens and D. A. Hill, the Section was greatly indebted.

J. N. L. B.

INTERNATIONAL CONGRESS OF ANTHROPOLOGICAL AND ETHNOLOGICAL SCIENCES

The Fourth Session of the International Congress was held at Vienna in September 1952, under the Presidency of Father Wilhelm Schmidt. Some 900 members from 43 countries attended the Congress: Great Britain was represented by some 30 delegates of 25 institutions, including the Royal Navy. L. C. G. Clarke, a Vice-President of the Society, and J. V. Mills represented the Royal Geographical Society.

The President of the Austrian Republic, Dr. Theodor Körner, performed the inaugural ceremony, and receptions to the delegates were given by the Federal Government in the Chancellery, by the Lord Mayor of Vienna in the Town Hall, by the Provincial Government of Styria at Graz, and by the Austrian Organizing Committee in the Kursalon at Vienna. Meetings were held, and most of the lectures delivered, in the University of Vienna, where a reception office was established and admirable arrangements made for the convenience of delegates. Each member was presented with a most interesting and informative dossier of books and papers, including a work entitled "Kultur und Sprache" issued by the Institut für Völkerkunde of Vienna University and a special "Festgabe" of the Anthropologischen Gesellschaft of Vienna.

Subjects within the purview of the Congress were classified in the following Sections:—General Anthropology; Special Anthropology; Palaeoanthropology; Biological Anthropology; History and Methods of Ethnology; Sociology; Religions; Art, Music, Dance; Cultivated Plants and Domesticated Animals; Schools and Ethnology; Europe; North Africa and South-western Asia; Africa; India; Far East; Australia and Oceania; America; Prehistoric Archaeology of Europe and Palaeoethnology of Eurasia; Demography; Psychology; Linguistics.

Added interest was imparted by displays of films, varying from still pictures of American Indian masks to coloured moving sound pictures of a hippopotamus hunt on the river Niger. The more important subjects of discussion included the declaration of UNESCO on the problem of races, and the research work urgently needed on cultures and languages threatened with early disappearance. The Congress favoured the creation of an international organization to carry out this work.

Members were regaled with informal meetings at the Kursalon and at Grinzing, an exhibition of books, performances of folk-dances, and various excursions, including a hair-raising journey over the Grossglöckner Pass. The Organizing Committee dispensed unsurpassed hospitality; and the chairmen of the meetings performed their duties with efficiency and tact. The next meeting of the Congress will be held at Philadelphia in 1956. J. V. M.

GEOGRAPHY AND THE CIVIL SERVICE EXAMINATIONS

In the regulations for the Administrative Class of the Home Civil Service (Method I) is the announcement that in 1954 Geography will carry 700 marks. It will then be possible for candidates who offer Geography to obtain all their marks for optional subjects on geography alone. The syllabus will be as follows.

Physical geography (two papers)—200 marks.

Meteorological processes and climatology. Hydrology: the study of rivers, lakes, seas and oceans. Landforms: their distribution, origin and evolution. Main features of land masses and ocean basins; the nature of the main soil groups of the world and the relation of plants and animals to their environment.

Human geography (three papers)—300 marks.

Candidates will be expected to show knowledge of economic and political factors, where appropriate, and the question papers will be such that candidates whose studies have been based on either the systematic or the regional approach will be able to attempt them. All three papers will contain broad general questions, and, in addition, Paper 1 will contain questions with special reference to Europe and the U.S.S.R.; Paper 2, questions with special reference to Asia and Africa; and Paper 3, questions with special reference to the Americas, Australia and New Zealand.

The geography of the British Isles (one paper)—100 marks.

Practical test—100 marks.

This will demand knowledge of cartographical methods and notations, and for this test drawing instruments may be required.

Specimen question papers based on the new syllabuses in Geography will be obtainable shortly on application to the Civil Service Commission. They will also be included in the pamphlet of question papers set at the examination of 1953 which will be published by H.M. Stationery Office at the end of the year.

THE SCOTTISH ICELAND EXPEDITION, 1952

The seven members of this privately sponsored expedition, which took place from July to September, were graduates and undergraduates from the universities of Glasgow, Edinburgh, Cambridge, Nottingham and Leeds.

After a long search in mountainous country in east Iceland for plant remains in "surtarbrandur" (charred remains of vegetation found between lava flows, and caused by the destruction of forests), six of these localities were found. Samples were taken for pollen analysis. The results so far are encouraging; approximately fifty species have been identified; age probably Pliocene, considerably younger than was expected. This was the first investigation of the surtarbrandur in this part of Iceland.

The southern tip of a large acidic intrusion cutting the Tertiary basalts immediately north of Lodmundarfjordur was mapped, and systematic sampling was carried out on the surrounding basalts. Five fjords were examined by the expedition. The final report on evidence for their origin will not be ready until April 1953, but it was found that glaciation certainly played an important part in, at least, remodelling the fjords.

D. McVean (botanist) made a systematic collection of some 250 species of flowering plants and numerous mosses, liverworts and lichens. Several species were recorded from new localities. An ecological study of the plant communities of these areas was also carried out for comparison with similar studies already completed by other workers in other parts of Iceland, and with a survey of certain parts of the Scottish Highlands. Remains of *Betula callosa* were discovered in a Miocene fossil deposit but no trace of the living tree could be found in the surrounding birch woods, as reported by the Icelandic botanist Löve. However, evidence was obtained of per-glacial survival on several of the mountainous headlands of the east coast, particularly on Skalanes, while topographical features strongly suggest that it escaped the over-riding ice-sheet.

As a basis for geological mapping, and because the Danish maps were found to be inaccurate, a considerable amount of plane-table surveying on a scale of

6 inches to 1 mile was carried out in Lodmundarfjordur, east Iceland, and Baula, west Iceland.

The Swedish "pulka" sledge was tested. It is a new type of light sledge, and was used successfully by three members of the 1950 British West Greenland Expedition. R. Dearnley and J. Pirrit found that it could be hauled comfortably —if on a frozen surface—by two men with a starting load of 180 lb. This means that a longer working period away from base camp could be planned, as in addition to essential scientific equipment, more food and paraffin per man could be carried. J. P.

CROZIER STRAIT

When the last of the Admiralty expeditions searching for Sir John Franklin returned from the Arctic in 1854, Cornwallis Island, or Cornwallis Peninsula as it was then called, was thought to be part of Bathurst Island, and was shown on the Admiralty charts as joined to it by a long narrow isthmus. During the Franklin searches the vicinity of this isthmus had been reached by, firstly, R. A. Goodsir, Surgeon, and John Marshall, Mate, from the *Lady Franklin* (Captain Penny). They travelled on foot along the east and north shores of the Cornwallis Peninsula during May and June 1851. They took no observations for position during their journey but worked entirely on dead reckoning, and their longitudes, based on those of Penny, were admittedly in error. The published accounts of their journey give no details of their proceedings after May 26, though they did not turn back till June 1, so no precise estimate of their farthest west position can now be given. But the charts published in September 1851 after the return of the Penny expedition show that Goodsir was considered to have turned back when he was in about long. 96° 30′ W. The actual delineation of the coastline by Goodsir was of little value since at times he was uncertain whether he was travelling on land or on frozen sea.

Secondly, G. F. McDougall, Second Master, from the *Resolute* (Captain Austin) examined the bay which now bears his name in July 1851. He took rounds of angles from Neale and Truro Islands, but did not reach the north shore of the bay. His survey shows several gaps between promontories around the north side of the bay, and in particular he mentioned when questioned by the Admiralty Committee that there was an opening in the north-east corner of the bay. His work appeared, and in fact was, accurate and dependable. Thirdly, Lieutenant Sherard Osborn from the *Assistance* (Captain Sir Edward Belcher) traversed the east coast of Bathurst Island in June and July 1853, reaching as far south as Goodsir Inlet in 75° 40′ N., and made an accurate running survey.

None of these explorers, apart from McDougall's mention of a gap to the north-eastward, suggested the presence of a strait or straits between Bathurst Island and Cornwallis Peninsula, and the isthmus between the two was accordingly shown unbroken on the Admiralty charts published in 1855.

In 1859 Captain Leopold McClintock returned in the *Fox* with the only written Franklin record which has so far been recovered. This said that the *Erebus* and *Terror* had "ascended Wellington Channel to lat. 77° N., and returned by the west side of Cornwallis Island." A strait between the two islands was thus shown to exist, and it appeared in approximately long. 97° 30′ W. in the Admiralty charts of 1869 with the name Crozier Strait. Captain Francis Crozier was the Captain of the *Terror*, on whom the command of the lost expedition had devolved on Franklin's death.

There is no record in the Hydrographic Office at the Admiralty as to the reasons for selecting that particular position for Crozier Strait, and the Arctic

Pilot, Volume 3 (1947) says "The existence of the strait was not discovered, and it is presumed that the Crozier Strait now shown on the chart was inserted after the discovery in 1859 of the documents left by the Franklin expedition on King William Island." But Osborn and McDougall were certainly living at the time the strait was inserted, and Goodsir's evidence may also have been available to the Hydrographer when the most probable position of the strait was being decided. Until recently the area was not revisited and Crozier Strait is shown on Admiralty Chart 2118 of May 1946 in the same position as in 1869.

After the Second World War the Canadian authorities began a comprehensive programme of aerial surveying in their northern territories, and a reliable survey of the Crozier Strait area was obtained in July 1947. This shows a large strait, some 6 miles wide, in a position which corresponds very fairly with the Crozier Strait of the Admiralty charts, and a narrower strait in the position which McDougall had indicated in the north-east corner of what might now be called McDougall Strait.

It cannot be stated positively, since there is no written record and no Franklin relics have yet been found in the vicinity, which strait the *Erebus* and *Terror* used, but ice conditions give a fairly definite indication. A series of photographs taken in early August 1950 shows that Queen's Channel and the east coast of Bathurst Island were completely open as far as the photographs extended; that Crozier Strait was completely open; and that the smaller eastern strait was solidly blocked at its southern end. Ice conditions vary enormously from year to year, but T. A. Harwood, who made a canoe journey round Cornwallis Island in August 1950, considers that there is a strong southerly set through Queen's Channel, Crozier Strait and McDougall Sound, whereas there is little current in the eastern strait, and what little there is sets to the northward to join the main southward stream in Wellington Channel. These streams encourage the break up of ice in Crozier Strait, but jam the ice at the southern end of the eastern strait.

The available evidence therefore tends to show that Franklin returned from 77° N. following the east coast of Bathurst Island as nearly as the ice would allow, passed through Crozier Strait at the end of August or beginning of September 1845, and reached Beechey Island in time to set up his winter quarters before being beset towards the end of September. C. E. K.

INTERNATIONAL GEOLOGICAL CONGRESS

The nineteenth International Geological Congress was held at Algiers from 8 to 15 September 1952. It was preceded by a series of excursions of up to a fortnight's duration, and succeeded by two further series extending well into the month of October. The meeting of the Congress itself consisted of three formal general sessions under the presidency of Professor Charles Jacob (Paris) and numerous meetings of the Sections and Commissions. At the opening general session a proposal by Professor Fourmarier (Brussels) that the veteran geologist and geographer, Emmanuel de Margerie, who at the age of sixteen attended the first Geological Congress in Paris in 1878, be elected Honorary President was carried by acclamation.

The Sections of the Congress of most interest to geographers were probably Section 4 on submarine topography and present day sedimentation (J. Bourcart), and Section 7 on deserts, ancient and modern (R. Capot-Rey). In Section 4 papers were read by R. J. Russell on the Mississippi delta, R. Petterson on deep sea sedimentation and F. P. Shepard and J. Bourcart on submarine canyons. In Section 7 geographers were above all interested in two groups of papers, one concerned with pediments (F. K. Morris, A. Howard, T. Benjamin

and F. Joly), and the second with dunes (P. Bellair, D. Holm and H. Smith). The discussion on pediments was particularly lively and a request was put forward for the creation of a Commission of the Congress on this topic. A letter from the President of the Geographical Congress at Washington requesting collaboration between the geographical and geological organizations on a variety of questions, and drawing attention to the unfortunate coincidence of the two Congresses, arrived too late for proper consideration by the Council. It is to be hoped that neither suggestion will be fruitless.

Probably the most important part of the work of the Congress was accomplished on the various excursions, numbering altogether forty-five. These excursions extended through the whole of Tunisia, Algeria, French and Spanish Morocco, and into parts of French West Africa. Some were devoted to the examination of relatively confined areas, others to special problems (particularly minerals and water supply) over wide sweeps of country. Two general excursions, the first in Tunisia and Algeria, the second in Morocco, were designed to give a general idea of the geology and geological problems of French North Africa as a whole. The first of these two, which attracted some three hundred members, took the form of a cruise in the *S.S. Champollion* along the coast from Tunis to Oran with daily excursions inland; it was made even more suitable to the needs of the geographer by the inclusion among its leaders of J. Despois, Professor of Geography at Algiers.

Special mention must be made of one of the excursions following the meeting at Algiers, namely that concerned with the geomorphology of Morocco, directed by Professor Jean Dresch (Paris). This excursion followed the excellent precedent set by Professors Wooldridge and Miller in 1948 on their geomorphological excursion from London to Wales before the London meeting of the Geological Congress, but it was set in a country perhaps even richer in variety of landforms, and certainly one where geological structures are far more readily recognizable at the surface. Not only did this excursion give an excellent opportunity of rapidly surveying the physical (and human) geography of the greater part of Morocco, and of continuous discussion with French colleagues, but, more important, it allowed an insight into the difficult problems of semi-arid morphological processes and the working methods of French geomorphologists. To one not accustomed to either of these, three impressions remain vivid; the close neighbourhood of zones both of great crustal stability and of continuous and continuing instability; the enormous work of erosion, deposition and even crustal movement accomplished during and since the Quaternary; and the decisive importance of climatic influences and climatic changes in determining the operation of morphological processes. A. F. M.

CATALOGUE OF MAPS IN THE BRITISH MUSEUM

The current part (No. LXXXIV) of the 'Accessions to the catalogue of printed maps in the British Museum' embodies a number of alterations in the form of entries which bring it more into line with modern cataloguing practice. Information essential to the map user is presented uniformly and concisely, mainly through typographical changes. Details transcribed from the maps are now readily distinguishable from the annotations of the cataloguer.

The catalogue covers a somewhat wider field than is indicated by the title, as it includes manuscript maps deposited in the Map Room and books dealing with cartography, placed in the reference collection of that Department. The volume is divided into two sections, new accessions and a small supplement mainly of reprinted entries. This division enables new accessions and, in particular, recently published material to be easily found.

The general arrangement necessarily follows that of the original catalogue published in 1885 and of subsequent supplements. It is a dictionary catalogue, the entries being arranged alphabetically under the names of the appropriate places and areas, with added entries under the names of cartographers. This method is no doubt convenient in a large collection like that of the British Museum, which contains very many maps and plans of small and scattered localities, but as a result items covering more or less the same areas may be dispersed through the catalogue. One would not expect to find "British Empire" as a sub-division of "Great Britain and Ireland," and "Ordnance Survey" appears as a sub-division of England (which incidentally covers England and Wales) and also of Great Britain. On the other hand there are also disadvantages in a systematic topographical classification.

Since this is the most comprehensive catalogue of maps currently printed in this country, its appearance in an improved form is to be welcomed. In the past its circulation has been limited, but it is understood that its publication in the ordinary way is being considered. G. R. C.

A CATALOGUE OF EARLY MAPS

The Commission for the Bibliography of Ancient Maps has recently published its report (*cf.* Section on Cartography, "International Geographical Congress," p. 82 of this number of *Geogr. J.*).

The Report is followed by two portions of the catalogue of maps and charts from the period A.D. 1200–1500, to which the Commission was obliged to limit its activities. The first fascicule covers maps found in the manuscripts of Macrobius, and the Catalan marine charts of the fourteenth century. The second, compiled by M. Destombes, lists fifteenth-century engraved maps. Each entry, in addition to bibliographical details and notes on the content of the maps, gives the location of the more accessible copies, with references to reproductions and to the relevant literature. This section contains sixty-six items, not counting the individual maps in Ptolemy's Geography. Reference may be made here to the more summary list printed by L. Bagrow in *Imago Mundi*, vol. 8 (1950) 106, which includes also plans of towns, and is useful for the thirty-four reduced reproductions of maps. M. Destombes' catalogue is of much value for reference, not least for its extensive bibliographies. It is much to be hoped that means will be found to publish the remaining sections, thus completing the bibliography for the period A.D. 1200–1500.

The Society has a limited stock of the Report for distribution. The two fascicules may be obtained from the Office for fifteen shillings, plus postage.

G. R. C.

CORRESPONDENCE

THE EGYPTIAN CLIMATE

Mr. Ireland's letter in the December 1952 number of the *Journal*, based on observations (recorded where?), certainly corrects my rash statement on page 429 of the December 1951 number that "there is little or no wind in this region (the latitude of Halfa)." My limited experience in the desert referred to led me to believe that, between the zones of northerly wind in the north and southerly winds in the south, there was a sort of buffer state (between lats. 24° and 20° N.) liable to be invaded from either side but very rarely by winds of force sufficient to move sand. For the correction I am grateful.

In his last paragraph, he greatly exaggerates the effects of casual rainfall, for

in the last sentence he asserts that "one such shower (of more than an inch) at a given locality every fifty or a hundred years for thousands of years might be expected to have very significant geological effects (and to contribute materially to the 'fossil water supplies')."

Now for rain to reinforce an underground water-table, it must fall and in places accumulate in sufficient quantity to soak the surface to a depth beyond the reach of evaporation. In a desert, such a saturation is hardly ever effected by direct fall but by seepage from the channels of the run-off. Optimum conditions are heavy and continuous rain on slopes composed of strata tilted so that impervious layers do not put a stop to infiltration. These conditions hardly occur in the Libyan Desert where the beds are nearly horizontal and the surface is frequently a plain covered with a foot or two of fine gravel and sand, sometimes pure sand, sometimes bare rock. Any rain that falls on the marshes of Qattara must go to reinforce the water-table and some of the rain falling on the limestone plateaux north and east of Kharga may penetrate through joints as far as the Esna shales beneath. But casual rain falling on the Nubian sandstone plateaux and plains of the south has little or no chance of evading the intense evaporation.

On dry sand, a fall of an inch of water will hardly penetrate more than is sufficient to fill the gaps between the sand grains, about 30 per cent. of the mass, *i.e.* about 3 inches. (This simple experiment can easily be checked.) In a dry warm climate, this will evaporate out again in a very short time.

The perfect preservation of the predynastic bodies found by the Archaeological Survey of Nubia, referred to on page 431 of my article, seems to provide positive proof of the non-penetration of the sand of the area in question by the rains of the last five thousand years. A casual fall on sand of an inch or so can have no cumulative effect. Certainly, on bare rock, there will be less penetration and more run-off.

G. W. MURRAY

MEETINGS: SESSION 1952–53

SPECIAL GENERAL MEETING, 13 October 1952. The PRESIDENT, Mr. J. M. Wordie, in the Chair

The necessary quorum of 50 being declared present, the President opened the Meeting.

Lord Catto explained that the Meeting had been called to consider the proposals of the Council to increase the Annual Subscription for all Fellows except those elected before May 1908 from £3 to £4 to meet the steep rise in costs suffered during recent years; to reduce the Entrance Fee from £5 to £4 to prevent the new rate of Annual Subscription from bearing too heavily on new Fellows; and, as some amelioration, to provide for the payment, by Banker's Order, of the new subscription and the Entrance Fee, by half-yearly or quarterly instalments if desired.

Mr. Brooks explained the Amendment proposed to Chapter IV, Para. 1 and the additional Para. (d) to Chapter V of the Bye-Laws, which were framed with a view to enabling the Society to take advantage of the system of payment of subscription by seven-year covenant.

Lord Rennell spoke briefly in support of Lord Catto and Mr. Brooks.

After some discussion on the various points the President put the Amendments one by one. The Amendment to Chapter IV and the additional paragraph under Chapter V were approved unanimously. The first Amendment to Chapter V 1 (a) paragraphs 1 and 2 was approved by a majority of 56 to 3 and the second Amendment to these paragraphs by a majority of 62 to 1.

Meeting of 27 October 1952. The President in the Chair

Paper: International expedition to Antarctica. By G. de Q. Robin

Meeting of 3 November 1952. Mr. Leonard Brooks in the Chair

Films: Korea through the year. Colour films with a commentary by William Courtenay

Exhibition. During November, a small historical exhibition of Chinese maps was shown

Meeting of 10 November 1952. Professor Wooldridge in the Chair

Paper: Tectonic relief. By Professor C. A. Cotton

Meeting of 17 November 1952. The President in the Chair

Elections to Fellowship: Mrs. K. P. Abbott; Ronald Henry Aldrich, J.P.; Major Tom James Whiteside Allen; Lloyd Michael Amui; George Warden Baker; Commander Cyril Assefrey Bamford, D.S.C., R.N. (retd.); Philip James Trounce Barbary; John Edward Barnes; Peter Blair; Eddie Boon Hoa; Miss M. B. Borchardt; David John Bosley, B.SC.; Alexander Campbell Brands, M.A., LL.B.; F. Oliver-Byrne; G. F. Cadd; Walter Leslie Carlyon; Francis S. C. Celoria, B.A.; Tony John Chandler, B.SC.; Miss Edna May Clark; Norman Lace Corkill; Mrs. Evan Davies; Commander Wendell Phillips Dodge; Miss Patricia Durand; The Rev. James Harold Eddleston; William Gladstone Egonu; Miss Mabel Mary Elder; J. D. Ferguson; Henry James L. Fitch; Miss Nancy Forrest; Lieutenant-Commander J. M. Francom, M.B.E., R.N.V.R.; Norman Eric Gamble; Miss Mildred Gascoigne; Samuel Stevens Gopaul; Julian C. Gyngell; Patrick Reginald Webb Haunton, M.SC.; Duncan George Davie Haws; Leslie Roy Howden; Zamir Hyder Jafri, B.SC.; Wing Commander Clifford George James, O.B.E., B.SC., R.A.F.V.R.; John Howard Jennings, B.A.; Major W. Lyall Johnson, R.A.E.C.; Arthur John Clare Kettle; John Elmer Kieffer; Cyrus Erachshaw Lalkaka; Brian R. Law; Ifor Wyn Lewis; Brian Fraser Macdona; Miss Jean McFarlane, M.A.; Miss Agnes McMaster; George Arthur Measures, B.A.; Major Arnold Mellor, A.R.A. (retd.); Major William Eric Wolfe Montgomery, M.B.E.; Dr. Thomas Arthur Munro; Miss Josephine A. Newbold; The Rev. James Oliver; Miss Daphne Helen Lloyd Owen; Henry Paulick; Alec Gordon Petrie; Miss Kathleen Philpot, B.A.; Dennis Maitland Powell; Maurice Geoffrey Powell; Mrs. James Ray; P. M. Head, B.A.; Edward Arthur Roberts; Ralph Neville Salvesen; Derek Lawrence Searle; T. D. Shucksmith, B.A.; George Raymond Simmons, B.ECON.; David Smyth; Joseph Haines Stiles; Lady Mara Henriette Suenson-Taylor; The Rev. P. J. Thomas, M.A.; T. G. Thomas; Miss Evelyn Todd; Paul Raby Topham; Miss Pamela Tower; John Mordon Lewis Tune; Brigadier John C. B. Wakeford, R.E. (retd.); Bernard Forrester-Walker, M.A.; Ronald Wesley Walmsley; Kenneth Charles Walters; W. R. M. Watson; Alfred Horace Williams; Henry Thomas Williams; Donald Henry Worth, B.SC.

Transferred from Associate Membership: Miss Janet E. Poll; Peter Pratt; Derek M. Ricks; Miss Betty Allen-Smith

Elections to Associate Membership: Miss Pauline Bayes; Roy Booth; Miss Helen R. Bush; Alvin Franklin Dean; John D. Garr; Miss Valerie Kathleen

Gould; Miss Patricia Rosa Granter; Anthony Kenneth Hester; Michael Frank Arnold Hames; John Bryan Hilling; Ahmed Zaheer Jan; Miss Diana F. Johnson; Alan W. Jones; Miss Janet Grace Lorimer; John Minter; Brian John Phillips; Miss Phebe C. Pope; Maurice F. Purnell; Jon Hugh Rees; Pedro Sanchez; Miss Janette Margaret Taylor; Miss Barbara Thompson

Paper: Kimberley Division of Western Australia. By the Rt. Hon. the Lord Rennell of Rodd

Meeting of 24 November 1952. Mr. Leonard Brooks in the Chair

Films: East African journey. Colour films with a commentary by G. C. Schluter

Meeting of 1 December 1952. The President in the Chair

Paper: Depth of Polar ice caps. By G. de Q. Robin and J. J. Holtzscherer

Meeting of 8 December 1952. The President in the Chair

Elections to Fellowship: Arthur Noel Ainley, B.A.; Reginald Berriff; John Bradburn, B.A.; W. D. Cameron; James Rawson Carson, B.A.; Keith Drummond Clark; Kenneth M. de Lanerolle, B.A.; Walter McK. Draycot, J.P.; R. A. French, B.A.; Colin Henstock; The Rev. Professor Arthur Herbert, M.A.; Dr. Alfred E. Hudson, M.A., D.SC.; Dr. A. J. R. Hudson; The Rev. Cyril Hunt; Stanley James Hutchence; Geoffrey Frank Jackson; Miss M. Jennifer Lee; Miss Meryle V. Lee; Miss Cecily Ann McDaniel; Joseph A. F. Martin; Spencer P. Minchin; Jonathan K. Phillips; The Rev. James Edward Preece, M.A.; Miss Alice May Salmon, B.A.; Colonel Robert Scott, Jnr.; Miss Olive Shepherd; Miss June A. Sheppard, M.A.; Harald R. L. Seabrook-Smith; Anthony Garth Stanley; Hector George Stone; Miss Mary S. Tebble; I. Hugh Thurston, B.SC.; George Henry Toole; Dr. F. D. duT. van Zyl, CH.M., F.R.C.S.; Major Eric N. Webb, D.S.O., M.C.

Transferred from Associate Membership: Miss Gwendolen Dougherty; B. A. J. Edwards

Elections to Associate Membership: Miss Maureen Allison Burton; Miss Margaret Rose Chappelhow; Miss Christine Mary Cooling; Tomothy Elwes; Keith Larrad; Miss Mary S. Main; Miss Margaret Jean Rayner; Miss Doreen Mildred Rolfe; Miss Judith Anne Tyler; Edward Essex Mountevan Wright

Paper: Land of Sinai. By G. W. Murray

Meeting of 15 December 1952. Mr. Leonard Brooks in the Chair

Film: Louisiana story. Documentary sound film

Meeting of 22 December 1952. The President in the Chair

Elections to Fellowship: Harry Robert Atkins, B.A.; Patrick John M. Bailey, B.A.; Alan Edward Boddy; Fitz-Eugene Dixon, Jnr.; Crawford E. L. Donohugh, B.A., M.S.; Miss Kathleen Eagle; Miss Margaret E. Garvie, B.SC.; Anson Gilchrist; Donald Frederick Hagger; Frederick Hallworth; Thomas Hampton; Trevor Howar Hickman; Robert Francis Jenkins; Miss Dorothy M. H. Jones, B.A.; Professor Augustin E. Lombard, D.SC.; John I. Moore; Miss Josephine H. Paine; Samuel F. Pryor; Dr. Lawrence O. Roberts; William Gordon Robinson; Mrs. Elizabeth Roughley; Allan Edward Scull; Maurice Upperton; Dennis Webster; Nicholas Wollaston

Elections to Associate Membership: Miss Pamela Buckley; William Neil Hird; Miss Delia Skinner; Jeremy H. Bradshaw-Smith

Paper: Expedition to Cho-Oyu. By Eric Shipton

Christmas Exhibition and Lectures. (See Society's News)

Meeting of 2 January 1953. Professor A. G. Ogilvie in the Chair

Paper: Relations of Geography and History. By Professor H. C. Darby. A joint meeting with the Geographical Association and the Institute of British Geographers

Meeting of 5 January 1953. Mr. Leonard Brooks in the Chair

Films: Audubon's America. Colour films with a commentary by Miss Katharine Tousey

Meeting of 12 January 1953. The President in the Chair

Elections to Fellowship: Anthony Leslie W. Annis, M.B.E.; William Athron Bedford; Edryn Beynon; Gerald J. Cohen; Lieutenant Ernest John Daugherty, R.A.R.O.; I. R. Evans; Colin Firth, B.SC.; Michael Ronald Fish; Robert Lionel Fleming; Lieutenant-Colonel John E. F. Gueritz, M.A.; Captain Cecil John Harris; David Richard G. Mordecai; Mrs. Mary Morgan; Serge E. Nicohosoff; Miss F. A. Pember; Lady Eleanor Reynolds; John Emery Stoddard; Robin Patrick Warrington; Terence Doohan, B.A.; Robert L. Douglas, B.A.

Transferred from Associate Membership: Miss Monica P. Bunt; Frederick E. Page

Elections to Associate Membership: Miss Sheila Ann Brown; Miss Gillian Elizabeth Chadwick; H. D. Dias; Henry Albert Lionel Ferguson; Miss Mary Joy Kimberley; John Michael George Layton; Miss Pat Procter; J. Brian Roberts; Michael Wood

Paper: Danish deep sea expedition. By Dr. Anton Bruun

Meeting of 26 January 1953. The President in the Chair

Paper: Problems of land use in the dry zone of Ceylon. By B. H. Farmer

Meeting of 2 February 1953. The President in the Chair

Elections to Fellowship: Miss Jean Aileen Ayre, B.SC.; The Rev. P. T. Chacko; Frank G. Christie, B.A.; Robert William Dunning; Ernst Fiddaman; Miss Clarissa Mary Gray; Angus Gore-Booth, B.A.; Ronald Derek Hayes; Jock Pirie Herbert, B.A.; C. S. Hider; Gainor W. Jackson; Mrs. Lotta M. Long; Medwyn Ormerod, M.B.E.; Yagya Dat Pande, M.A.; Denis Percy Parnham; Walter Oswyth Rice, B.A.; Cyril James Symonds; James R. M. Williams; L. I. Williams-Norbury

Elections to Associate Membership: Bryan Kelsey Edgley; Miss Shirley Gardiner; Jolyon Smurthwaite

Paper: South Georgia survey. By Duncan Carse

Meeting of 9 February 1953. Dr. E. Hindle in the Chair

Film: Nanook of the North. Documentary silent film

Meeting of 16 February 1953. The President in the Chair

Paper: Pattern of population trends in England and Wales, 1921–51. By Dr. E. C. Willatts and Mrs. M. G. C. Newson

THE ROYAL GEOGRAPHICAL SOCIETY

KENSINGTON GORE, LONDON, S.W.7

FELLOWSHIP AND ASSOCIATE MEMBERSHIP

The object of the Society being the Promotion and Diffusion of Geographical Knowledge, it has always welcomed to its Fellowship those anxious to further this object by their interest and support, as well as those able to take a more active part in the work of discovery and exploration.

FELLOWSHIP

The Bye-Laws provide that a candidate for admission to the Fellowship of the Society must be proposed by a Fellow personally known to him and seconded by another Fellow. Further, that a candidate is not eligible until he (or she) is twenty-one years old, unless he holds a Commission in Her Majesty's Forces or he (or she) is a matriculated student of a University of the United Kingdom or the Self-Governing British Dominions. Proposal forms can be obtained on application to the Director and Secretary.

Every Fellow shall be required to pay on election *either* £4 as Entrance Fee and £4 as Annual Subscription for the current year and thereafter an Annual Subscription of £4 due on 1st January in each year; *or* a single compounding fee of £60.

The Entrance Fee and first Annual Subscription may be paid in four quarterly instalments of £2 each; or the Entrance Fee and first two Annual Subscriptions may be paid in four half-yearly instalments of £3 each. Thereafter the Annual Subscription may continue to be paid in four quarterly instalments of £1 each or two half-yearly instalments of £2 each respectively. Entrance Fee and Annual Subscription may be paid by instalments only where payment is made by Banker's Order. Half-yearly instalments shall be due on the 1st January and the 1st July; quarterly instalments shall be due on the 1st January, 1st April, 1st July and 1st October.

For Fellows who are under the age of 25 years on election the Entrance Fee shall be reduced from £4 to £2. The Entrance Fee and first Annual Subscription may be paid in four quarterly instalments of £1 10*s*. 0*d*. each or the Entrance Fee and first two Annual Subscriptions may be paid in four half-yearly instalments of £2 10*s*. 0*d*. each; thereafter payment may be by instalments as above. Entrance Fee and Annual Subscription may be paid by instalments only where payment is made by Banker's Order.

Fellows may compound for their Annual Subscriptions at any subsequent time by a payment of £60 less £2 for each Annual Subscription paid in excess of five with a minimum of £20 after 25 payments.

No Fellow shall be entitled to vote or to enjoy any privilege of the Society while in arrear.

ASSOCIATE MEMBERSHIP

The Bye-Laws covering the terms of Associate Membership provide that—

1. *A candidate must be not less than 17 and not more than 20 years of age. He (or she) must be recommended by a Fellow, University or School authority.*
2. *Subscription shall be £2 per annum without Entrance Fee.*
3. *On attaining the age of 21 Associate Members become eligible for Fellowship. The Entrance Fee of £2 shall be waived provided they have been Associate Members for 3 years. Otherwise Associate Membership shall cease at the age of 21.*

All subscriptions are payable in advance, on the 1st of January in each year.

PRIVILEGES OF FELLOWS AND ASSOCIATE MEMBERS

The privileges of a Fellow or Associate Member include admission (with one Friend) to all ordinary Meetings of the Society, and the use of the Society's House, Library and Map-room. Each Fellow is also entitled to receive a copy of *The Geographical Journal*. Associate Members have the choice of receiving either *The Geographical Journal* or *The Geographical Magazine*. Associate Members may not describe themselves as F.R.G.S. and have no vote at Annual or Special General Meetings.

A pamphlet giving details of the Society and a copy of the Charter and Bye-Laws will be sent on application to the Director and Secretary.

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